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ORIGINAL ARTICLES

Physiologic Basis for Treatment of Paralyzed Muscle.....	H. M. Hines, Ph.D.; J. D. Thomson, Ph.D., and B. Lazere, M.S.	69
Results of the "Long Arc" and the "Short Arc" Treatment in the After-Care of Poliomyelitis.....	C. O. Molander, M.D., and Bertha Weinmann, M.D.	74
Physical Therapeutic Procedures in Otolaryngology; A Résumé of Twenty Years' Experience.....	A. R. Hollender, M.D.	88
Manipulative Surgery.....	John W. Fredette, M.D.	93
Need for Physical Therapy Technicians....	John S. Coulter, M.D., and Howard A. Carter, B.S. in M.E.	100
Editorials		105
Medical News		110
Book Reviews		114
Physical Therapy Abstracts.....		118

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PHYSIOLOGIC BASIS FOR TREATMENT OF PARALYZED MUSCLE *

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and

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The purpose of this report is to present evidence from animal experimentation concerning the physiologic conditions most favorable for retarding atrophy and enhancing the recovery of function in muscle after peripheral nerve injury. The choice of procedures for the treatment of paralyzed muscle may be either empiric or deduced from theoretic considerations concerning the basic causes of denervation atrophy. If the theory of overwork and fatigue from continuous fibrillary activity, as proposed by Langley¹ and more recently supported by Levine, Hechter and Soskin,² is valid, little enthusiasm can be marshaled for a regimen of activity. On the other hand, if the disuse theory of atrophy is upheld, favorable results from a program of activity may be anticipated. In addition to the technics evolved from a consideration of the basic causes of atrophy, attention also must be given to possible effects of fatigue and overstretching on muscle undergoing atrophy or regeneration. It should be recognized, however, that a limited period of inactivity and immobilization may be necessary for the protection of freshly sutured nerves from possible injury due to movement and stretching, regardless of any unfavorable effects that these conditions may have on the course of atrophy and regeneration.

Experiments

Procedure. — Studies in relation to these questions were carried out on the gastrocnemius muscles and tibial nerves of adult albino rats. Complete denervation of the muscle was accomplished by crushing the tibial nerve. In some experiments the muscle and nerve of the undenervated contralateral limb served as the control. In others, when experimental conditions permitted, the corresponding muscle of both limbs was denervated, one serving as the experimental member and the other as its control. At designated times after operation studies were made on the control and experimental muscles as to their strength, weight and creatine concentration. Muscular strength was determined by measuring the maximal isometric tension that developed in response to supermaximal stimuli applied either directly to the muscle or to its motor nerve. In normal tissues the tensions developed from direct stimulation and from stimulation of the nerve are essentially equal. The effectiveness of activation of the nerve increases during regeneration until it ultimately approximates that resulting from direct stimulation of the muscle. The methods employed for denervation, stimulation and tension measurements have been described in detail elsewhere.³ From the results of studies carried out on a large number of animals it is concluded that the course of atrophy and of regeneration in the rat are remarkably constant if attention is

* Read at the Mid-Western Sectional Meeting of the American Congress of Physical Therapy, Iowa City, Iowa, April 6, 1942.

given to the exact location of the lesion and if animals are carefully matched as to age, body weight and sex.

Immobilization.—Immobilization of the denervated gastrocnemius muscle was accomplished by inclosing the limb from the foot to the hip in a plaster cast. The cast was applied with the muscle in the neutral rest position. The denervated noncasted muscle of the contralateral limb served as the control. The cast was left in position for a duration of eighteen, twenty-one or twenty-eight days. Examination of the muscle as to weight and strength was made in some instances immediately after the removal of the cast and in others some days later.

The presence of the cast was found not to affect significantly the rate of

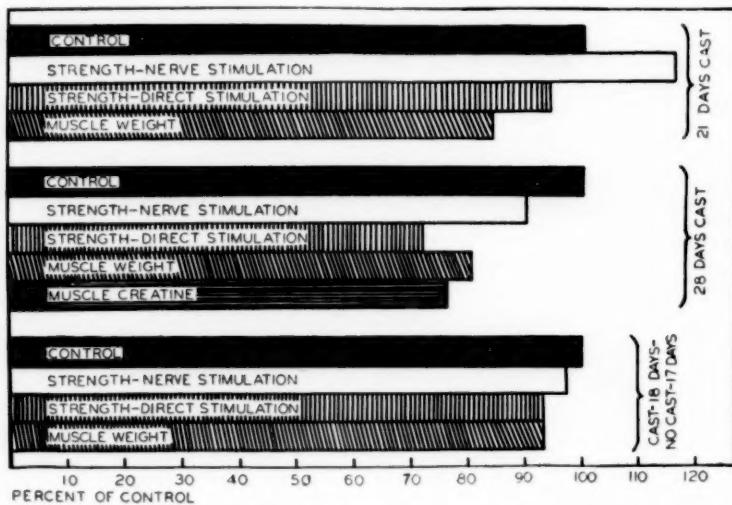


Fig. 1.—A graph showing average values for the effects of immobilization on atrophy and regeneration. The black bars represent values on noncasted denervated control muscle and are expressed as 100 per cent.

muscle atrophy occurring prior to reinnervation (fig. 1). The absence of effect is thought to be due to the fact that denervated muscle is already undergoing atrophy at a maximum rate because of a state of inactivity which cannot be further enhanced by immobilization. However, when the cast was left on during the period of reinnervation, it was found that the resulting immobilization definitely retarded the recovery of mass and strength by the previously paralyzed muscle (fig. 1). This effect was not due to a delayed or less effective reinnervation but to a lack of activity on the part of the newly reinnervated muscle units. If natural activity had been permitted it would have checked further atrophy and stimulated regeneration of the muscle. The data concerning the relative amounts of tension developed through direct stimulation and stimulation of the nerve indicate that the state of immobilization was not favorable to an earlier and more effective reinnervation (fig. 1). The studies on muscle mass and strength indicate that no advantage was gained by immobilization during the time of complete paralysis and that when the immobilization was extended into the period when reinnervation and recovery from paralysis were occurring, it definitely delayed the recovery of weight and strength by the affected muscle.

Exercise.—One group of animals after denervation was subjected to forced activity in a revolving cage. The exercise consisted of alternate fifteen minute periods of exercise and rest for a total of four hours per day. The

revolving cage forced the animals to undergo considerable exertion in the course of their efforts to maintain an upright position and to following the moving floor. The movements made by the animals were often such as to cause a considerable degree of stretching of the paralyzed muscle. The controls for the experiment consisted of a group of animals of the same age, body weight and sex distribution which, after operation, were confined to small cages for the duration of the experimental period.

Studies made on the muscles and nerves at twenty-one days after denervation showed that the muscles from the exercised group were slightly but consistently superior in strength and weight to those from the non-exercised control group (fig. 2). There was no evidence that the stretching

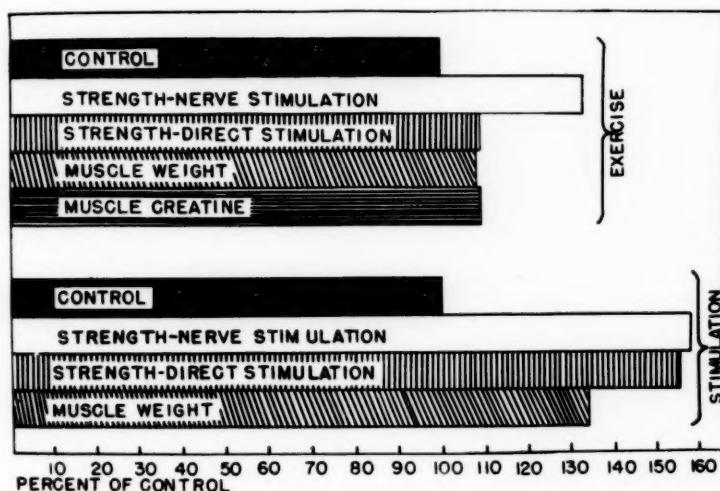


Fig. 2. — A graph showing average values for the effects of activity on neuro-muscular regeneration. The black bars represent average values on nonstimulated denervated muscle expressed as 100 per cent. The measurements in all cases were made twenty-one days after denervation.

of the paralyzed muscles by the contraction of their antagonists had in any way impeded recovery from paralysis.

Electrical Stimulation. — As muscle units deprived of their motor nerve supply do not exhibit contractions other than fibrillary activity unless activated by adequate artificial stimuli, it was deemed advisable to determine the effects of electrical stimuli on the course of atrophy and regeneration. The results of previous investigations have been inconclusive as to the efficacy of electrical stimuli in retarding the rate of atrophy following denervation. Fischer⁴ and Guttmann and Guttmann⁵ have reported favorable results, while the studies of Chor and collaborators⁶ showed negative effects. In the experiments reported herein, the tibial nerves of both limbs were crushed. Induction shocks at a frequency of one hundred and twenty per second were applied directly to the muscle of one limb for a period of three minutes per day. Light ether anesthesia was employed during the period of stimulation. The strength of the stimulus was kept constant in any one group of experiments but was purposely varied in different groups. In all the experiments the limb was supported and the foot weighted with a 50 Gm. load. Attempts were made to evaluate the relative efficiency of electrical stimulation at various times in the course of atrophy and regeneration by employing experimental periods of either seven, twelve, fourteen or twenty-one days before

tests were made on the muscles and nerves. In some experiments the atrophy was allowed to progress for some time before the commencement of stimulation. The nonstimulated denervated muscle of the contralateral limb served as the control.

The results indicate that artificial stimulation retarded the rate of atrophy and enhanced the regeneration of denervated muscle (fig. 2). A direct relation existed between the strength of the electrical stimulus and its effectiveness in delaying muscle atrophy (fig. 3). Weak stimuli which caused

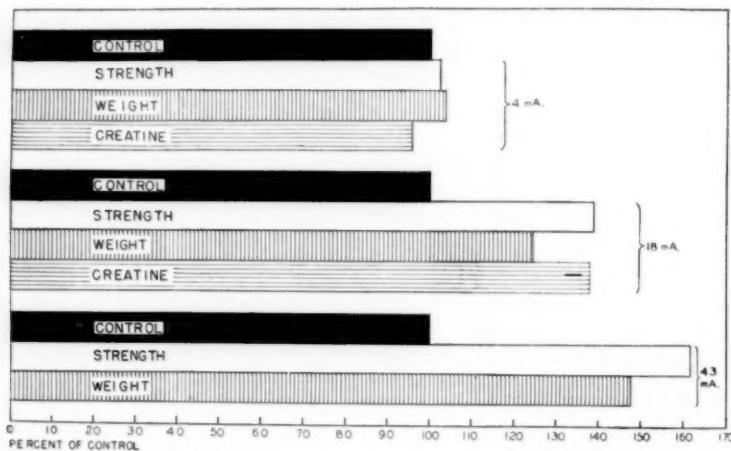


Fig. 3. — A graph showing average values for the effects of electrical stimulation on the rate of muscle atrophy. The stimuli were of different intensities (expressed in milliamperes) and applied for three minutes daily for fourteen days. The black bars represent the control expressed as 100 per cent. The control values were from nonstimulated denervated contralateral muscles.

only feeble contractions in the paralyzed muscle exerted little effect on the course of atrophy. Strong induction shocks which caused vigorous contractions of the paralyzed muscle resulted in a decreased rate of atrophy. The muscles treated with such shocks were larger and stronger and possessed a higher concentration of creatine than that found in their nonstimulated denervated and contralateral controls. Strong electrical stimuli were found to be effective in periods early or late after denervation and also after the onset of reinnervation. Reports have been numerous concerning the effectiveness or noneffectiveness of different types of electrical stimulation in the treatment of paralyzed muscle. It would seem probable that any form of electrical stimulus which is capable of eliciting strong contractions in paralyzed muscle will be found to be effective in decreasing the rate of atrophy. If this is true, the basis for the selection of the frequency, duration, kind and intensity of the stimulus can be the comfort and tolerance of the patient. It should be pointed out that in our experiments on animals the strength of an effective electrical stimulus was such as to require light ether anesthesia.

Fatigue. — Numerous reports have appeared in the literature emphasizing the importance of avoiding fatigue in muscle during its recovery from paralysis following peripheral nerve injury. In general, there is a paucity of experimental evidence to support such contentions. In our experiments a state of almost complete fatigue existed in the paralyzed muscles at the conclusion of a period of stimulation with strong induction shocks. In spite of the daily production of a high degree of fatigue, the stimulated muscles and

nerves showed better recovery than did those in the contralateral nonstimulated control limbs. It is to be pointed out that the conditions to which the muscles were subjected resulted in local fatigue but probably no appreciable degree of general bodily fatigue.

Although our experiments dealt with totally denervated muscle, it may be pertinent to discuss their possible applications to the treatment of partial paralysis of muscle, such as frequently occurs in poliomyelitis. In this condition a certain amount of functional recovery from the early paralysis is usually anticipated. The lack of functional activity resulting from immobilization would probably lead to a considerable degree of atrophy in the non-paralyzed muscle fibers and would prevent or impede the recovery of weight and strength by such fibers as might ultimately regain functional innervation. In addition, unfavorable effects could result from joint stiffness and the development of substitution muscle action. One might surmise that the muscle fibers which ultimately are to exhibit some degree of recovery from their state of initial paralysis could be spared a considerable degree of atrophy by frequent artificial stimulation. However, certain possible deleterious effects of such therapy should be considered. The strong stimuli required effectively to activate the paralyzed units might result in a reflex activation of substitution muscle groups. Furthermore, it is not known what effect such stimuli might have on muscle spasms. It would seem that a more logical regimen would be to rely on natural activity to prevent atrophy from disuse of the nonparalyzed muscle fibers and to initiate activity as early as possible in such motor units as may ultimately show recovery from the initial paralysis.

Summary and Conclusions

A study has been made of the effects of various conditions on the extent and velocity of atrophy and regeneration in skeletal muscle following peripheral nerve injury. The experiments were carried out on the gastrocnemius muscles and tibial nerves of adult albino rats. Complete paralysis of the muscle was produced by crushing the tibial nerve. At various times after denervation quantitative studies were made as to muscle mass, strength and creatine concentration. The values were compared with those obtained from studies on normal control muscles and on untreated denervated muscle.

Immobilization of the paralyzed muscles by casts had little effect on the rate of atrophy but definitely delayed the progress of recovery following reinnervation.

Forced exercise in a revolving cage had no deleterious effect on the extent and rate of neuromuscular regeneration. The average values for muscle strength and weight were slightly higher in the exercised group than in the control nonexercised group.

Electrical stimulation of paralyzed muscle if of sufficient intensity to induce strong contractions delayed atrophy and enhanced recovery from paralysis.

A state of marked fatigue brought about through artificial stimulation did not appear to impede the extent or velocity of neuromuscular regeneration.

The application of these findings on the experimental animal to the treatment of clinical patients exhibiting complete or partial paralysis is discussed.

(Continued on page 99)

RESULTS OF THE "LONG ARC" AND THE "SHORT ARC" TREATMENT IN THE AFTER-CARE OF POLIOMYELITIS *

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and

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This analysis of muscle recovery following poliomyelitis was undertaken to determine whether use of the "short arc," the restricted range of motion, had any advantage over use of the unrestricted "long," or "full," arc of motion in the after-care of the disease. Both methods apply to passive as well as to active exercises, to underwater and to table treatment.

Two groups of patients were studied under strict adherence to the rules for each method and were given various objective tests through a long period of observation.

Comparison of the two groups has proved no easy task. The erratic course of poliomyelitis has rendered it difficult to apply mathematical tests to results of any form of treatment. Many factors influencing the speed and the amount of recovery are involved. There are cases of spontaneous recovery. Others show wide variability in the severity of the attack, in the patient's resistance to the virus and in his characteristic mental attitude.

The number of patients studied was necessarily small. Only patients with recent paralysis could be utilized and only patients who could be kept under treatment and observation for the entire period of investigation. Patients with older paralysis on whom various other methods of treatment had been tried were not eligible for the present study. Some patients were lost by permanent removal from town.

Few previous studies in this field have been made in which continuous and thorough observations have been carried on through a period of approximately three years. The methods of testing, precise and objective, will be described later.

Eighteen patients with poliomyelitis were treated and observed. Their ages varied from $3\frac{1}{2}$ to 38 years. The period of observation included the summer of 1939 to the summer of 1942, the patients being seen from the onset of their disease in the summer months. Six patients from 1939 were observed for almost three years; 5 from 1940 for about one and a half years; 7 for more than one-half to one year.

The treatment of poliomyelitis in the acute stage is still a controversial subject and has led to much discussion. The recovery period is long. The virus of the disease attacks nervous tissue, mainly the anterior horn cells, which include the motor nerve cells innervating the skeletal muscles. Recent investigations suggest that other structures of the nervous apparatus, possibly the motor cortex, the sympathetic nervous system and the muscles themselves, may also be involved. The after-treatment used in this study is

* Final Report to the National Foundation for Infantile Paralysis.

* Aided by a grant from The National Foundation for Infantile Paralysis, Inc.

based on the assumption of disease of the anterior horn cells, or, more definitely, disease of the neuromotor unit.

The recovery period may be regarded as lasting from three weeks to three years — and even longer — depending on the type and degree of damage: temporary damage, through round cell infiltration, hemorrhage, edema or impaired nutrition of tissue, and partial or complete damage to the cell body.

When fever, pain and muscle tenderness disappear, the inflammatory process in the spinal cord is assumed to be subsiding. Hitherto it had been generally accepted that until pain and tenderness were no longer evident the first test and treatment should not begin. Recently new trends favoring earlier treatment have developed. Clinical signs suggest earlier treatment as advantageous. In the present investigation, therapy was instituted only on the disappearance of pain and tenderness.

Use of the unrestricted "full arc" and the "short arc" in the after-care of infantile paralysis has aroused much controversy. Full, unrestricted range of motion from the beginning of the exercise program has been advised by A. T. Legg, S. I. Franz, R. W. Lovett, Miss Merrill and others. R. W. Lovett advocated muscle training as "aiding the patient to perform a certain movement with the hope of stimulating an impulse from the brain to the muscles." He stated that "every muscle is connected with several centers and some of the centers in any one region will have escaped destruction." "In such muscles there remains some initiative and with it the power of developing more muscular volume and new associations by repeated passages of impulses from brain to muscles." A. T. Legg prescribed the use of the full arc of motion "in order to get the full mechanical effect of the joint action on circulation" and also to "establish the habit reflex and obtain better coordination of the nerve centers through frequent repetition of a normal movement."

In opposition to these energizing measures, Sir Robert Jones, C. F. Taylor and others have emphasized rest, protection and the restriction of movement. Sir Colin MacKenzie advised the "small arc of motion" in passive and active exercising. H. O. Kendall and F. P. Kendall developed a regular system of after-care for poliomyelitis according to the same principles. MacKenzie advised starting work on weak muscles in the horizontal plane, beginning with about one-third of the full range of motion. The Kendalls start with a "zero position," in which both antagonistic muscle groups are completely relaxed. These principles, developed before the era of underwater treatment, were adapted by the Kendalls to underwater treatment. They stressed the possible damage to weak muscles by malposition and by the pull of gravity or of strong antagonists. They advised the method of "muscle setting" for the weakest muscles. For the next stage, passive or assisted motion from the zero position in a small arc to both sides was advised. A slow increase of range to full arc motion was permitted only with returning muscle power.

Of our two groups of patients, "short arc" patients were treated according to the Kendall system. "Long arc" patients were taken through the full, unrestricted arc of motion passively from the start. When there was persisting pain, the treatment stopped at the pain limit. As soon as we were able to relieve the pain by use of heat (radiant heat, hot baths, hot packs), the range of motion was increased. Treatment for both groups comprised daily underwater exercises in the pool or in the Hubbard tank, heat and massage and for some patients table exercises also. The only difference in

the treatment of the two groups was the range of motion in exercising. The exercises were chosen and graded according to the condition and strength of the muscles as shown by the preceding muscle tests. The table exercises were performed partly on the exercise board and partly without any support. Assistance given, especially in the initiation of the movement, was carefully watched and decreased gradually with improving muscle function. Eventually resistance was given and graded according to returning muscle power. Elimination of gravity and of friction is important during the first stages of muscle reeducation and is obtained in the tank or pool with help from the buoyancy of the water. On the treatment table almost the same condition can be obtained by using roller skates on a horizontal board. The skates may be attached to the arms or legs in various positions. Flexion-extension exercises of the hip, of the knee and of the shoulder and elbow, as well as adduction-abduction exercises of the legs and arms, may be done in this way. A hinge in the wooden board helps to change the inclination of one or both halves of the board in order to make the patient move against a certain amount of gravity, affording a gradually increasing effort.

Special precautions were taken to avoid fatigue, overexertion and the stretching of weak muscles by malposition. The patients were under constant orthopedic supervision.

The patients were hospitalized for a period of two to thirteen months, usually for not less than six months. When dismissed from the hospital and sent home, they had regular hospital treatment as outpatients in our department (some of them daily, some twice a week), or they had physical therapy at home. In some cases visiting nurses gave the treatment; in certain ones the mothers were taught and advised how to carry out the exercise program. We supervised and checked all dismissed patients at regular intervals.

The best objective way to compare the effects of different methods of treatment is by accurate testing at regular intervals. The testing must be done by the same examiner and as far as possible under standardized conditions. This means that the same kind of bed or table and the same kind of support or assistance should be used that the patient had used before and that the test should be made at the same time of day as previously.

In our preliminary studies we examined previously used tests of various kinds, revising and adapting them for accuracy and reliability. These tests were made on normal healthy persons first (our technicians and physicians). Some of the tests had to be discarded and replaced by new ones. An ergograph test for muscle fatigue which was satisfactory for normal subjects had to be discarded, as it could not be adapted to work efficiently on weak muscles. We were able to develop a reliable and simple test for fatigue for our patients. It is performed with the set of spring balances which are also used for grading muscle power and will be described in detail later.

The tests used by us were (1) functional muscle test, (2) range of motion test, (3) muscle strength test, (4) fatigue test, and (5) roentgen ray examination.

1. The functional muscle test is the one generally accepted, as used by Miss Plastridge and others. Muscles were graded as: normal, good, fair, poor, trace or zero. The muscles were classified according to their ability to perform a prescribed simple movement: (a) against gravity and resistance — normal; (b) against gravity only — good; (c) gravity eliminated, in horizontal plane, full range of motion — fair; (d) gravity eliminated, partial range of motion — poor; (e) trace of motion — trace, and (f) no trace of motion

— zero. Using figures, we classified (a) normal as five, (b) good as four, (c) fair as three, (d) poor as two, (e) trace as one, and (f) no trace as zero. A plus or minus sign after a grade was used often, if it seemed helpful, so that a muscle might be graded "fair plus" or "good minus." This helped to determine stages between grades and to record slight degrees of improvement or loss of function.

Our charts used in muscle grading included seventy-four muscles. They were approximately the same as the charts used and described by Miss Plastridge, Kendall and others. For evaluating progress in our group statistics, we used only those muscles which can be graded easily and with greater precision. We used in our group analysis the functional test on sixteen muscles (32, including those on both sides): deltoid, trapezius, pectoralis, triceps, biceps, small muscles of thumb, back, abdominal muscles, ilio psoas, gluteus maximus, gluteus medius, quadriceps, hamstring, gastrocnemius, tibialis anterior and posterior, and peroneal muscles.

2. The range of motion test was done with a half-circle protractor devised by D. Silver.¹ For recording and easy reading we devised a chart system which has been described.² We had forms printed showing a half-circle protractor scale ranging from zero to 180 degrees. Four empty half-circle spaces were used for recording the patient's measurements at four different times. In conjunction with the printed charts we used a set of nineteen rubber stamps (six of them shown in figure 1), each fitting into the center of the printed chart. Each stamp depicted a movement of a joint, showing the average normal range of motion. This made it easy to show graphically the patient's deviation from the normal range. In recording, we used a red line for marking the active range of motion and a blue line for the passive range. Figure 2 shows the record of active and passive range of a patient at four different times. Improvement or change in range could be compared easily from one test to another.

3. For the muscle strength test a set of spring balances was used to measure the patient's ability to resist pull. The patient's resistance was measured in pounds and half-pounds. Martin and Lovett³ have described this test and worked out standard positions for the testing of different muscle groups. Recently A. A. Schmier⁴ improved the testing instruments. His sets of spring balances have an automatic inker recording the maximum muscle power in pounds of capacity. Reading mistakes are avoided and less assistance is needed. Printed charts were used for the automatic recording.

This test requires an amount of active muscle power which some of the affected muscles often regain only later and some never. It can be used therefore for the most part only in later stages of the recovery period. The test was used by us only in the stage in which we used resistance in exercising the muscles. In some cases, however, with muscles only slightly affected, the test may be applied early. In some cases some of the affected muscle groups could not be subjected to this test.

However, we found this test useful for grading returning muscle power as soon as the patient was able to work against resistance. The recorded increase of muscle power from one test to the next one was striking and impressive in many of the cases.

Figure 3 shows the results of four of our large collection of strength tests. The four tests were done on the same muscle group (hip adductors) of the same patient (H. B.) at different times. The first test was done three months after the onset of the disease and the others five, six and nine months

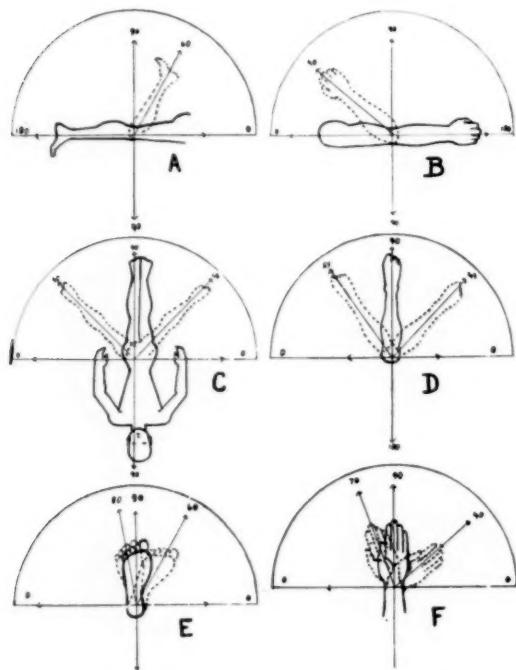


Fig. 1. — Six rubber stamps showing normal range:
A, knee, flexion-extension; B, elbow, flexion-extension; C, hip, abduction-adduction; D, hip, rotation; E, foot, inversion-eversion, and F, hand, radial-ulnar duction.

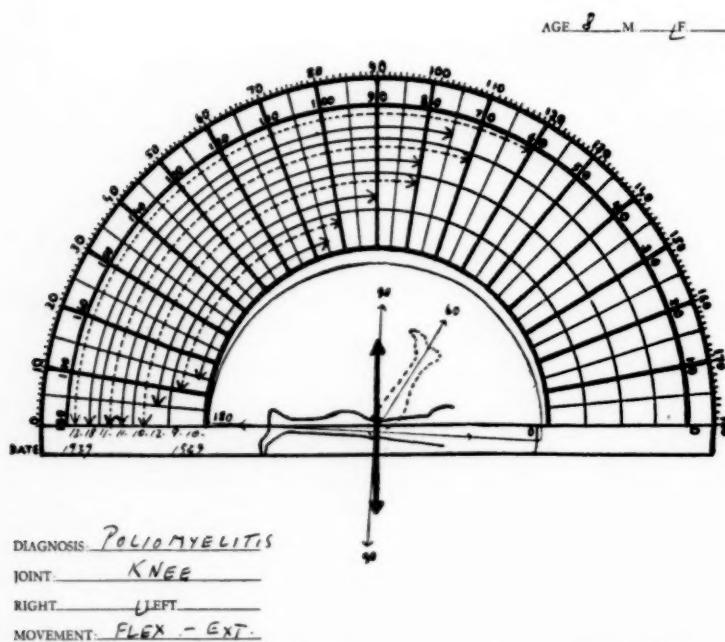


Fig. 2. — Record of active and passive range of a patient at four different times.
The broken lines represent blue (passive range) and the dotted lines red (active range).

after the onset. The gradual increase of muscle power from 14 pounds to 39 pounds within six months is remarkable.

4. A new type of fatigue test has been developed and has proved useful in several respects. By repeating the spring balance test in succession we have noticed that the resistance decreases at a variable rate. This rate of decrease is dependent on the state of the tested muscles. In order to obtain accurate evidence of the decline of resistance and of the absence or presence of fatigue in certain muscle groups, we undertook to record such repetitive tests. New charts were printed, graded in pounds and half-pounds, similar to the strength test charts but wide enough to record ten to fifteen pulls.

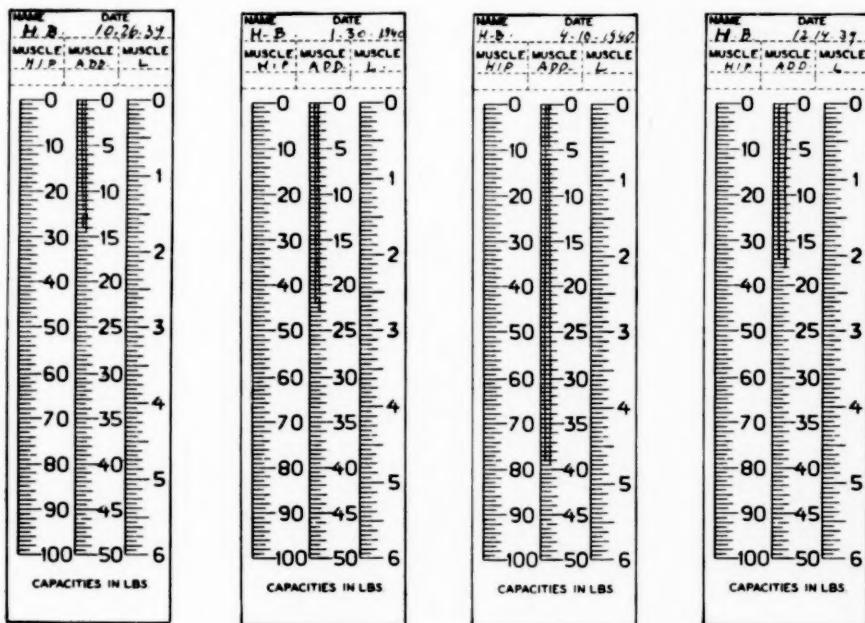


Fig. 3. — The results of four muscle strength tests on H. B. performed three, five, six and nine months after the onset of the disease.

This test has been described in detail.⁵ It has the advantage of furnishing:

- A. Objective evidence not only of the single effort but of the average, maximal and minimal strength of a number of successive efforts, recorded in pounds.
- B. A method of determining the variability of resistance. The deviation from the maximal strength is calculated in percentages of the maximum and is a measure of the fitness of the muscle.
- C. A measure of the rate of fatigue. The angle formed by a line connecting the recordings of the single efforts and its inclination to the horizontal line is a rough index of fatigue. The absence of fatigue in perfectly normal muscles is indicated by a nearly horizontal line connecting the single records. Fatigue, or decline of resistance, is illustrated by the steep angle of the connected tops with the horizontal.
- D. A method of detecting considerable differences in groups of muscles which previously had a normal rating of 5, if tested as to range and resis-

tance. As our test shows, the muscles still may prove to have a subnormal reaction in their fatigue curve. This fact is shown by the curves in figure 4.

Figure 4 shows the records of the hip adductors of both sides of patient D. W. The simple strength test (*A* and *B*) shows identical strength (17 pounds) on the two sides. It is interesting to see that our fatigue test shows a considerable difference between the left (strong) and the right (weak) side. On the left side the variation between maximal and minimal strength was 18:16, while on the right side it was 17:10. The decline on the weak side from 17 to 10 forms a steep angle on the graph, indicating the decreasing resistance or the rate of fatigue. It is characteristic also that on the weak

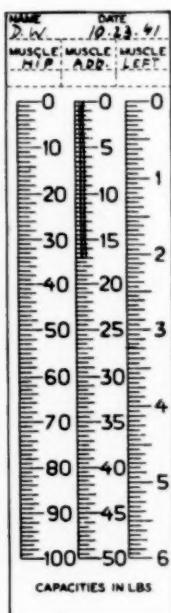


Fig. 2A

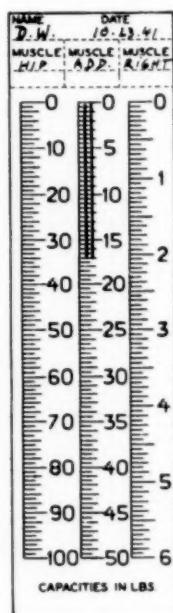


Fig. 2B

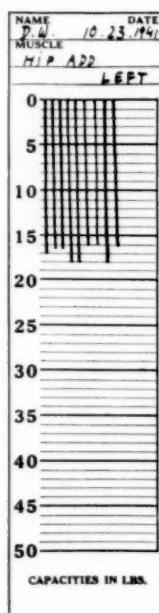


Fig. 2C

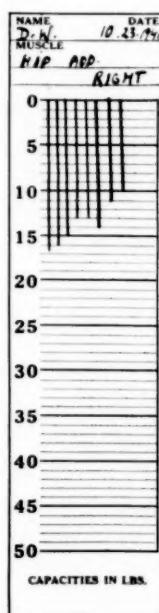


Fig. 2D

Fig. 4. — *A, B*, strength tests of right and left hip adductors show no difference; *C, D*, fatigue tests reveal weakness of right side, showing decline of resistance.

side the maximal strength was attained in the first effort only and was not reached in later efforts. On the strong side the maximum was attained later and reached not only once but several times.

5. Roentgenograms were taken by Dr. S. Mesirow of all our patients at different stages. We hope to publish in collaboration with him a complete study on this subject.

Whereas formerly the changes in bone in poliomyelitis were ascribed to immobilization, this study provided findings which tended to indicate that other factors were to be considered.

The impression gained from the study suggested a relationship between the bone changes and neurovascular trauma.

Thus in adults (aged between 36 and 38) the roentgenograms of the knee revealed a subcortical mottled radiolucence which took the form of multiple small, round, almost cystlike zones measuring about 3 to 4 mm. in diameter. The zones appeared to be relatively well demarcated from the sur-

rounding bone. This finding contrasts with the general osteoporosis with reduction in bone density which is supposed to occur in post-traumatic immobilization.

In the adolescents (aged 16 to 18) the osteoporosis that occurred took the form of a translucent band of varying width at or close to the site of the closing or closed epiphysial lines.

In the smaller children (under 14) the bony changes tended to resemble those associated with so-called immobilization changes, mainly a general osteoporosis.

The roentgenologic findings in our series were at such variance with the changes commonly accepted as occurring in poliomyelitis as to warrant further and more careful study.

No marked difference between the two groups of patients could be stated on the basis of these findings.

The tests mentioned were useful practically in following up the course of recovery of each patient. The treatment, the kind and the amount of muscle training and the time to encourage the patient to walk or work are determined by evaluation of the different tests.

However, in comparing the improvement of individual patients and of groups of patients with one another, a special method of determining percentages of recovery had to be used. A standard method of determining the percentage improvement worked out by H. E. Hipps⁶ was accepted with slight modifications and used as described hereafter.

A muscle having gained in function more than two grades (for example, from trace to fair plus) or having become perfectly normal was considered to have made an "excellent recovery." A gain of more than one grade was considered as "good" recovery, of one grade as "moderate" and of less than one as "slight." We were somewhat stricter than H. E. Hipps, who graded gains of more than one as "excellent," of one as "moderate" and of less than one as "slight." His requirements for the grade "excellent" were lower than ours, and he had no grade between "excellent" and "moderate."

To simplify the correlation, H. E. Hipps used percentages in his tables instead of the terms "excellent," "good," etc. Our classification (again slightly different from Hipps's classification) gave an "excellent" recovery grade as 100 per cent improvement, "good" as 75 per cent, "moderate" as 50 per cent and "slight" as 25 per cent. No trace of improvement was, of course, listed as "zero per cent." In our tables for statistical purposes the number of affected muscles of the individual patient were recorded in one column. Different columns were used for muscles with different grades of improvement. This is shown in table 1. The number of muscles in each of these columns was multiplied by the percentage value of the column. The resulting figures (number of muscles multiplied by percentage value) added together and divided by the number of affected muscles gave, roughly, the individual patient's percentage of recovery.

As stressed by Hipps, it should be remembered that the percentage improvement does not apply to the patient's ability to walk normally or to perform other functions. This grading applies only to the improvement of function and strength of the single muscles which were affected and impaired. A patient might show a high percentage of muscle improvement and walk with a bad limp because the gluteus or the quadriceps was still weak,

while a great number of muscles less important for the function of walking had gained in strength, and *vice versa*.

TABLE 1.—*Percentage Recovery of Individual Patients and a Group of Patients.*

Name	Recovery Zero %	Recovery 25%	Recovery 50%	Recovery 75%	Recovery 100%	No. of Muscles Affected	Total	Recovery Percentage
M. S.	0	2	2	6	18	28	2,400	85.5
M. K.	5	2	2	14	3	26	1,500	57.6
B. G.	0	5	6	5	6	22	1,400	63.6
								5,300

Table 1 illustrates the process of determining the percentage recovery for individual patients and for a group of patients:

Taking an example (M. S.), we translated the terms "excellent recovery" into "100 per cent recovery" and listed the eighteen muscles found in this state in the 100 per cent column. Six muscles with "good recovery" were listed in the 75 per cent column, two with "moderate recovery" in the 50 per cent column and two with "slight recovery" in the 25 per cent column. In this case there were no muscles without a trace of recovery, which would have been classified in the zero column. Procedure:

18 muscles showing 100% recovery =	1,800
6 muscles showing 75% recovery =	450
2 muscles showing 50% recovery =	100
2 muscles showing 25% recovery =	50
<hr/>	
Total	2,400

The "total" (2,400) was then divided by the number of muscles affected (28) in order to give the net percentage recovery of the patient, which was 85.

The second patient (M. K.), had five "zero" muscles, which were listed in the zero % column. The "total" was 1,500, which, divided by the number of muscles affected (26), gave a percentage of 57.6 as the net recovery.

In determining the net recovery of a group of patients, the sum of the single "totals" (in table 1, 5,300) was divided by the total number of affected muscles (76), which gave a net recovery for the group of 69.7 per cent.

This method of evaluation to determine the differences between the recovery of the "short arc" and that of the "long arc" patients after different periods of time gave informative results (tables 2 to 6, inclusive).

Table 2 shows the recovery of the two groups of patients after the first half-year of therapy, table 3 after one year, table 4 after eighteen months, table 5 after two years and table 6 after two and a half years of therapy.

The recovery of the long arc group compares favorably with that of the short arc group at every stage. After six months there was a group net recovery of 64.4 per cent in the long arc group, as compared with a group net recovery of 50 per cent in the short arc group.

After one year the long arc group showed a net recovery of 79.6 per cent, as compared with a 72 per cent net recovery for the short arc group.

After eighteen months the difference between the net recovery of the long arc and of the short arc group was more marked. The long arc group showed a 84.2 per cent net recovery, while the short arc group showed a net recovery of 71.6 per cent.

After two years the net recovery of the long arc group was 95.4 per cent, as compared with a 76.7 net recovery for the short arc group.

After two and one-half years the net recovery in the long arc group

TABLE 2. — *Percentage of Recovery of the Two Groups After Six Months.*

Short Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
M. S.	0	2	2	6	18	28	2,400	85.7
M. K.	5	2	2	14	3	26	1,500	57.6
A. P.	7	2	0	5	5	19	925	48.6
B. G.	5	8	2	5	2	22	875	39.7
A. R.	4	9	2	1	15	31	1,900	61.3
H. R.	7	1	0	0	7	15	725	48.3
J. C.	4	3	2	7	6	22	1,300	59.1
E. B.	15	9	0	6	2	32	875	27.3
J. R.	8	9	1	1	1	20	450	22.5
						215	10,950	
							10,950 ÷ 215 =	
							50% group recovery	

Long Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
H. N.	3	3	0	3	2	11	500	45.4
B. M.	0	0	0	0	8	8	800	100
B. E.	3	1	3	7	4	18	1,100	61.1
M. R.	2	1	8	3	2	16	850	53.1
L. T.	0	1	0	4	1	6	425	70.8
J. R.	8	3	3	4	5	23	1,025	44.5
B. D.	1	2	1	1	7	12	875	72.9
D. S.	2	2	2	2	1	9	400	44.4
H. B.	0	1	4	1	21	27	2,400	88.8
						130	8,375	
							8,375 ÷ 130 =	
							64.4% group recovery	

TABLE 3. — *Percentage Recovery After One Year.*

Short Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
M. S.	0	2	1	6	19	28	2,450	87.5
M. K.	2	0	2	6	16	26	2,150	82.7
A. P.	7	0	2	3	7	19	1,025	53.9
B. G.	0	5	6	5	6	22	1,400	63.6
A. R.	4	4	7	0	16	31	2,050	66.1
						126	9,075	
							9,075 ÷ 126 =	
							72% group recovery	

Long Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
M. R.	2	0	0	0	14	16	1,400	87.5
L. T.	0	1	0	3	2	6	450	75
J. R.	6	2	1	0	14	23	1,500	65.2
D. S.	2	2	0	4	1	9	450	50
H. B.	0	0	1	0	26	27	2,650	98.1
						81	6,450	
							6,450 ÷ 81 =	
							79.6% group recovery	

TABLE 4.—Percentage Recovery After Eighteen Months.
Short Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
M. S.	0	2	1	6	19	28	2,450	87.5
M. K.	4	2	1	6	13	26	1,850	71.1
A. P.	7	0	0	3	8	18	1,025	56.9
B. G.	0	4	5	7	6	22	1,475	67.0
A. R.	4	6	1	2	18	31	2,150	69.3
						125	8,950	
							8,950 ÷ 125 =	
							71.6% group	
							recovery	

Long Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
M. R.	2	0	0	0	14	16	1,400	87.5
I. T.	0	1	0	2	3	6	475	79.7
J. R.	5	0	1	3	14	23	1,675	72.6
D. S.	0	2	0	4	3	9	650	72.2
H. B.	0	0	1	0	26	27	2,650	98.1
						81	6,825	
							6,825 ÷ 81 =	
							84.5% group	
							recovery	

TABLE 5.—Percentage Recovery After Two Years.
Short Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
M. S.	0	0	0	6	22	28	2,650	94.6
M. K.	4	2	1	6	13	26	1,850	71.1
A. P.	7	0	0	3	8	18	1,025	56.9
						72	5,525	76.7
							5,525 ÷ 72 =	
							76.7% group	
							recovery	

Long Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
H. B.	0	0	1	0	26	27	2,650	98.1
I. T.	0	1	0	1	4	6	500	83.3
M. R.	0	2	0	0	14	16	1,450	90.6
						49	4,600	
							4,600 ÷ 49 =	
							93.8% group	
							recovery	

was 94.8 per cent, as compared with a net recovery of 76.7 per cent for the short arc group.

It was observed that in almost all the patients in the short arc group contractures formed within the first weeks or months. These occurred mostly in the quadriceps and in the arm adductors, but also in the hamstrings and in the gastrocnemius muscles and in some patients in other muscle groups as well. With the long arc patients it happened on occasions that the stage of pain and tenderness lasted long enough to permit contractures to appear, but they were overcome more easily and earlier than in the short arc patients.

TABLE 6. — *Percentage Recovery After Two and One-Half Years.*
Short Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
M. S.	0	0	0	4	24	28	2,700	96.4
M. K.	4	2	3	4	13	26	1,800	69.2
A. P.	7	0	0	3	8	18	1,025	56.9
						72	5,525	
							$5,525 \div 72 =$	
							76.7% group recovery	

Long Arc.

Name	Recovery 0%	25%	50%	75%	100%	No. of Muscles Affected	Total	Recovery Percentage of Patient
H. B.	0	0	1	0	26	27	2,650	98.1
I. T.	0	1	0	1	4	6	500	83.3
M. R.	0	0	2	0	14	16	1,500	93.7
						49	4,650	
							$4,650 \div 49 =$	
							94.8% group recovery	

Hot packs were applied for several hours a day to the 5 hospitalized patients of the 1941 series, this treatment being started several months after the onset. It was not begun earlier, since the announcement of the National Foundation for Infantile Paralysis, recommending the Kenny treatment came in December, 1941. Furthermore, it was not possible to apply regular Kenny treatment immediately, so we compromised by using hot wet packs for as long a period daily as our nurses were able to manage. The contractures in the patients of this series were overcome earlier and more thoroughly than in our previous series, in spite of the lapse of time between the onset of the disease and the use of this treatment.

Different muscles and muscle groups were compared as to their tendency to recover. Table 7 shows the number of involved muscles in our "short arc" and our "long arc" group of patients.

TABLE 7. — *Number of Muscles Affected.*

Muscle	Short Arc	Long Arc
Deltoid	6	7
Trapezius	10	7
Triceps	5	7
Thigh muscles	15	10
Dorsiflexors of foot....	13	7

Of these muscles, some had made "excellent recovery" (up to normal or more than two grades in the functional test) within the first six months. Their distribution is shown in table 8.

We found that some of the muscles had not regained any function or power six months after the onset of the disease, despite therapy. They are summarized in table 9.

TABLE 8. — *Muscles Showing Excellent Recovery.*

Muscle	Short Arc		Long Arc	
	Affected	Excellent Recovery	Affected	Excellent Recovery
Deltoid	6	2	7	4
Trapezius	10	3	7	4
Triceps	5	3	7	2
Thigh muscles	15	1	10	5
Dorsiflexors of foot	13	2	7	1
Total	49	11	38	16
Percentage		22.4	...	42.1

TABLE 9. — *Muscles Showing No Improvement After Six Months.*

Muscle	Short Arc		Long Arc	
	Muscles Affected	Muscles Not Recovered	Muscles Affected	Muscles Not Recovered
Deltoid	6	1	7	1
Trapezius	10	1	7	2
Triceps	5	0	7	0
Thigh muscles	15	6	10	1
Dorsiflexors of foot	13	9	7	2
Total	49	17	38	6
Percentage		46	...	15.7

These tables show that:

1. More leg muscles than arm muscles were involved by the disease.
2. The recovery of arm muscles showed a better average than the recovery of leg muscles. Of forty-two arm muscles, eighteen showed excellent recovery after six months. Only nine of forty-five leg muscles showed excellent recovery after six months, while eighteen had not gained in function or power within this period.
3. The recovery of the muscles in the long arc group showed a definitely better average than the recovery of the muscles in the short arc group. Of forty-nine short arc muscles, eleven (22.4 per cent) made an excellent recovery within six months and seventeen (46 per cent) showed no sign of improvement after this time. At the same period, of the thirty-eight long arc muscles sixteen (42.1 per cent) showed excellent recovery and only six (15.7 per cent) showed no improvement.

The gains in range of motion were compared in the two groups six months after the onset of the disease. Knee flexion-extension, hip flexion-extension, shoulder flexion-extension and shoulder abduction-adduction were recorded. The number of joints in which return of the full passive range and part of the active range was observed is shown in table 10.

TABLE 10. — *Gains in Range of Motion After Six Months.*

Motion	Short Arc		Long Arc	
	No. of Joints Affected	No. of Joints With Full Passive Range	No. of Joints Affected	No. of Joints With Full Passive Range
Knee flexion-extension	18	8	8	7
Hip flexion-extension	18	6	9	9
Shoulder abduction-adduction	9	4	6	5
Shoulder flexion-extension	9	4	6	5
Total	54	22	29	26
Percentage		40.7	...	89.6

After six months of treatment, in the long arc group, twenty-six of twenty-nine affected muscles (89.6 per cent) had regained their full passive

range of motion and part of their active range. Of the short arc group only twenty-two of the fifty-four muscles (40.7 per cent) had regained the same range.

After one year, one and one-half years and two years of treatment and observation, the full passive range and more or less of the active range had been restored in almost all the joints in both the short and the long arc group. However, the functional tests (as shown by tables 2 to 6) of the two groups showed definitely that the slower gain of range of motion in the short arc group due to the restricted movement in the exercise program had no advantage in restoring function or muscle power.

Summary

Our survey of the long arc and the short arc treatment in 18 patients with poliomyelitis has shown a definitely higher percentage of improvement of function in the long arc group, H. E. Hipp's standard method of determining the net percentage of muscle improvement having been used with slight modifications.

The group net recovery after six months was 50 per cent for the short arc and 64.4 per cent for the long arc group; after one year, 72 per cent for the short arc and 79.6 per cent for the long arc group; after eighteen months, 71.6 per cent for the short arc group and 84.5 per cent for the long arc group; after two years, 76.7 per cent for the short arc and 95.4 per cent for the long arc group and after two and one-half years, 76.7 per cent for the short arc and 94.8 per cent for the long arc group. The further advantage of the long arc treatment is seen in the range of motion records. The full range (passive) was reached much earlier in the long arc group. The same range was reached comparatively late, in some cases only after forced stretching and manipulation during anesthesia, in the short arc group. The gain in muscle strength, as measured and recorded in pounds of resistance in individual cases, showed that the recovery in the long arc group was in no way impaired by too much strain on the muscles "stretched" by the full movement.

Our results appear to show convincingly that use of the full, unrestricted arc of movement causes no harm and, in fact, has certain advantages over use of the short, restricted arc of movement.

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PHYSICAL THERAPEUTIC PROCEDURES IN OTOLARYNGOLOGY: A RÉSUMÉ OF TWENTY YEARS' EXPERIENCE *

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The rapid strides in otolaryngologic therapy recorded during the past quarter of a century are attributable to several circumstances. Perhaps the most important is to be found in the fact that progressive otolaryngologists have never surrounded their specialty with a fence of self sufficiency but have always considered it as part and parcel of general medicine and surgery. As a corollary the science of otolaryngology has not limited itself to research and refinements in technics for its immediate needs, but has availed itself of any and all new discoveries in medicine that could logically be applied also to the conditions encountered in otolaryngologic diseases. Thus, to cite only one example, the introduction of sulfonamide pharmacals has proved also an outstanding contribution to the chemotherapy of infections of the ears, nose and throat.

Another circumstance responsible for the effectiveness of otolaryngologic therapy is the fact that many workers in the specialistic field have continued to re-evaluate old measures and by laboratory and clinical research to show their sound pathophysiologic basis. This applies particularly to any and all known physical measures, to a review of which this communication is limited. I submit the following brief but critical observations based on long experience of my own as well as that of other workers. The agents to be reviewed are old. Heat, light and electricity have been employed more or less empirically for many years.¹ Research and refinements of technics, however, have established them on a more recent and more concretely scientific basis.

Phototherapy

Allusion has already been made to heat as a therapeutic agent. One of its commonest modern sources for medical purposes is the infra-red generator. It is only when radiation is absorbed that it is converted into energy which can be both measured and utilized. Then, according to Bierman,² it is converted into electrical, thermal, chemical or mechanical energy, and in human beings may also produce psychic and other effects. Whether the energy so produced is electrical, thermal, chemical or mechanical depends entirely on two factors, viz., wavelength and the character of the absorbing substance. Some time ago I³ contended that the particularly favorable results experienced with infra-red treatment can be ascribed to a distinctly chemical reaction. Such a chemical effect combined with arterial hyperemia manifests itself by an enhancement of local metabolism and oxidation as well as an increase of drainage and relief of stasis, to which should be added a bactericidal action.

Clinically, the prolonged application of infra-red radiation has been productive of improved results in the management of acute infections of the upper respiratory tract. Fabricant⁴ has recently shown experimentally that in acute rhinitis or acute rhinosinusitis it is desirable to lower the alkaline pH of the nasal mucosa to an acid level between 5.5 and 6.5. According to this

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author acceptable therapy for these conditions includes (1) the careful selection and administration of an appropriate nasal constrictor, (2) the assurance of sufficient rest and adequate sleep and (3) the judicious administration of external heat for the relief of pain in properly selected cases. "Each of these well recognized therapeutic measures produces uniformly a single nasal *pH* phenomenon—acidity." A distinct drift toward acidity in nasal secretions, induced by the administration of external heat to the face for twenty minutes, as observed by Fabricant, may well explain the undoubted beneficial effects of infra-red radiation in infections of the upper respiratory tract.

In acute aural disease infra-red manifests analgesic properties.⁵ It is, however, inferior to short wave diathermy. Infra-red heating for otitis media from a suitable generator is superior to heat radiation from the commoner sources of conductive heat, because it lends itself more readily to control of dosage and bodily penetration. That photothermal radiation penetrates human tissue has been proved by various tests.⁶

In general, infra-red radiation is beneficial for acute, subacute or chronic inflammatory processes in or about the head and neck whenever thermotherapy is indicated. Its facility of application, in addition to the other factors already mentioned, places this agent among the more important therapeutic adjuvants in otorhinolaryngology.⁷

Phototherapy

The scientific status of phototherapy or ultraviolet irradiation in otolaryngology is now fairly well established. It has proved most beneficial in tuberculous otitis media. The earlier work of Cemach,⁸ and Lussman and Bendove⁹ has been repeatedly substantiated in my own experience. Combined general and local irradiations not infrequently hasten the otherwise protracted healing of mastoidectomy wounds.¹⁰ Ultraviolet irradiation is beneficial also in lupus of the auricle. It is still employed by some workers for erysipelas, though this treatment has now largely been superseded by chemotherapy.

Laryngeal tuberculosis is another disease for which ultraviolet irradiation occasionally proves a valuable aid.¹¹ It should, however, be regarded merely as a conservative measure in the sense that curative intervention should be deferred until a favorable immunologic state has been attained.¹² For practical purposes one may regard the reactions following phototherapy in laryngeal tuberculosis as strongly akin to those observed after the injection of tuberculin.¹³

The cold ray orificial unit, which facilitates the irradiation of accessible cavities, such as the nasal chamber, enables one to subject the intranasal membranes to radiation with varying reactions. Repeated observations and studies, however, have shown that the field of usefulness for this method of topical therapy remains limited in scope.

Short Wave Diathermy

The striking effects of conventional diathermy early suggested the need for an investigation of the indications for, and limitations of, its applicability in otolaryngologic practice. Sixteen years ago, Cottle and I¹⁴ experimentally demonstrated the superiority of diathermy over conductive heating, and our findings have since been corroborated by other investigators. More recently, short wave diathermy has superseded the conventional type, and because of its greater facility of application has been more generally utilized.

In otologic diseases short wave diathermy has proved of limited use. It possesses merit in the management of pyogenic infections of the auricle and ear canal, in certain cases of tubotympanic catarrh and in acute otitis media when deep heat is indicated, but aside from these conditions it has no other indications.

All sorts of claims have been advanced concerning the therapeutic virtues of short wave diathermy in the therapy of nasal sinusitis. The assertions of certain authors not only that it is an entirely new and distinct method of therapy, but that, apart from its acknowledged ability to produce heat in depth, it possesses peculiar physiologic and biologic properties affecting cellular life, certainly belong to the realm of mystery. It is now well recognized, and I am in strict accord with the opinion, that up to the present no physiologic effects other than those attributable to heat have been demonstrated. There is, however, no question that short wave diathermy easily overcomes the ohmic resistance offered to conventional diathermy by osseous structures and therefore is capable of creating heat in bones, a factor which at once suggests new therapeutic possibilities in regions of the human body containing bony structures, and therefore in the management of nasal sinusitis. Short wave diathermy can be safely utilized in empyemic conditions of any of the sinuses, but claims of certain European workers¹⁵ that surgical intervention may thus be obviated have not been substantiated in my experience.

My studies¹⁶ have demonstrated three important facts in connection with the use of short wave diathermy in the treatment of acute and chronic nasal sinus disease:

1. It is ineffective as an exclusive remedy in acute sinusitis.
2. It is under no circumstances curative in chronic sinusitis.
3. It is, however, an effective aid to indicated accepted procedures in the treatment of acute sinusitis, hastening the abatement of symptoms and shortening the course of the disease.

This statement is based on the treatment in hundreds of cases, carefully diagnosed and properly controlled, and is, I know, in contradiction to the recently published claims of Brighton, Snow and Friedman,¹⁷ whose results were based on only 25 cases. Furthermore, as I¹⁸ have previously shown, allergic and hyperplastic forms of sinusitis are contraindications to local heat in any form; as a matter of fact, in most cases of chronic sinusitis the condition fails to yield to short wave or other local nonsurgical procedures because of fixed tissue changes.

Galvanism

In our specialty the galvanic current is employed therapeutically mainly for ion transfer, a procedure which is applicable to the ears and the nose. For chronic suppurative otitis media zinc ion transfer is now seldom if ever used in this country, since simpler and more effective methods have been introduced.

For nasal allergy, however, this form of ion transfer, in my opinion, still enjoys a rightful place among local nonspecific procedures. The most that has been claimed for ion transfer in the treatment of allergic rhinitis is prolonged and decided palliation. If specific immunization for this condition were as successful as most allergists claim, there would be no place for an empiric electrolytic method, but unfortunately their statistical results of cures are more fanciful than actual.

A few years ago I published a paper¹⁹ dealing with the controversial problems in nasal ion transfer and summarized them as follows:

1. Iontophoresis renders the nasal mucous membrane less sensitive to sensitizing agents, thereby interrupting unduly sensitive reflex arcs.
2. Condemnation of nasal ion transfer by allergists and rhinologists is unjustified, because such an attitude is based on prejudiced reports and not on personal experience.
3. The claims of certain authors that ion transfer produces severe reactions, anosmia and harmful permanent effects on the nasal mucosa have not been borne out in many thousands of treatments.
4. Factors which militate against favorable results are incorrect diagnoses, underlying systemic causes or relationships, improper selection of cases and faulty technic.
5. Ion transfer is usually employed when specific immunization has failed after a prolonged trial. Even though the results are merely palliative in about half of the cases, the percentage must be considered sizable, since the group represents difficult and resistant cases.

Aside from its application in nasal allergy, zinc ion transfer has been found to be an effective means of preventing the recurrence of nasal polyps.²⁰ Its action is not as certain as that of radium, but for patients who cannot for economic or other reasons enjoy the benefit of postoperative radium therapy, it is a desirable and satisfactory substitute. Whether polypoid recurrence is prevented through its astringent effect or through other influences on the intranasal structures is at present not known. Suffice it to say that the method has proved successful in a fairly large series of cases. And so far as possible injurious effects on the nasal mucosa are concerned—an argument usually advanced by those unfamiliar with ion transfer—what harm can be done by any procedure on tissue that is already hyperplastic? Certainly the action of ion transfer is less caustic and far less penetrating than that of radium.

Electrosurgery

Surgical diathermy, though in reality a purely operative rather than a physical agent, is included here because of its great interest to progressive otolaryngologists. The same principles which govern the use of diathermy in general surgery apply with equal force to otolaryngologic surgery. The currents are utilized either to dissect soft tissues, much as one does with the scalpel, or to coagulate structures, which is a form of extirpation.

Electrosurgery has largely replaced cauterization for various intranasal conditions. Tags, stumps, remnants and recurrent lymphoid masses in the tonsillar fossa are ideally managed by electrocoagulation. Some lesions of the larynx and ear are likewise extirpated satisfactorily by either electrocoagulation or electrode desiccation, a method of depriving tissues of their fluid content and resulting in their becoming shriveled, as it were. Neoplastic lesions of the uvula, palate, gingivae and other parts of the oral cavity are not infrequently best eradicated by electrosurgery.

Malignant neoplasms of the ear, nose and throat may require a combination of procedures for their extirpation, followed by postoperative radiation. Some accessible growths lend themselves to total excision. The facility with which a malignant neoplasm may be successfully managed electrosurgically depends on a number of factors, chief of which is accessibility. There are some growths which are best managed by classic excision, with final coagulation of the base to complete the operation. The size of the neoplasm and its proximity to vital structures are other important considerations. They are of special moment when the growth extends to certain areas of the neck, where injury to the larger vessels may lead to serious complications. In extensive electrosurgical operations on the tongue or other structures in the mouth or pharynx, precautions against violent hemorrhage must be taken by preliminary ligation of the external carotid artery.

That electrosurgery has contributed to the surgical management of cancer is a well recognized fact. Blech²¹ has aptly emphasized that the destruc-

tive action on cancer cells within the area demarcated by electrocoagulation and the sterilizing effect of this procedure on adjacent tissues represent major advantages not attainable with scalpel surgery.

Conclusions

The advantages which physical procedures have offered to otolaryngologic therapy have earned for them a definite place in the armamentarium of the ear, nose and throat specialist. During the past twenty years extensive experience in the utilization of physical agents has definitely demonstrated that certain methods possess merit while others are valueless. No claim is made that any one physical procedure is a specific or a panacea. Sufficient is now known, however, to show that physical agents may be scientifically and effectively applied in otolaryngologic practice either as independent measures or as aids to standard therapeutic procedures.

Summary

1. Natural remedies in one form or another have been resorted to by the otolaryngologist since the inception of the specialty.
2. The application of external heat to the face in acute infections of the upper respiratory tract produces an acidity of the nasal secretions as shown by the experimental studies of Fabricant, that may be the factor responsible for the beneficial effects of infra-red radiation in acute rhinitis and acute rhinosinusitis.
3. Phototherapy remains a useful and beneficial method in certain tuberculous conditions of the ear, nose and throat.
4. Short wave diathermy represents an advance over conventional diathermy for deep heat application in inflammatory processes and as such has proved a valuable aid in the management of acute sinusitis. It is, however, valueless in chronic sinus involvements.
5. Zinc ion transfer, in spite of arguments to the contrary, is an effective non-specific local procedure which offers prolonged palliation in nasal allergy. It is also an effective means of preventing polypoid recurrence.
6. Electrosurgery is a valuable operative method in otolaryngology for the removal or destruction of benign and malignant lesions, replacing the older and poorly controllable method of cauterization, with their manifold disadvantages.

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(Continued on page 109)

MANIPULATIVE SURGERY *

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The term manipulative surgery has little to recommend its widespread use, other than the fact that it lends dignity to a procedure which is worthy of much more consideration than it has received in the past.

Manipulative treatment of joints is simply a method of mobilization whereby normal function and relief from disability and discomfort are brought about by the release of adhesions in and about the joint.

There is no unusual or mysterious technic associated with this procedure, and it can be employed by any one who can apply a few recognized principles and who is qualified to make an accurate diagnosis. It is true, as in all other manual procedures, that "practice makes perfect," and one gradually acquires the knowledge of when and how much to manipulate.

The medical profession has been reluctant to accept manipulation as a therapeutic measure. This has been due in a large part to the extravagant claims made by bone setters and unqualified practitioners based on obviously erroneous diagnoses. It must be admitted, however, that a sufficient number of patients have sought and obtained relief by manipulation to make it evident that this procedure should no longer be set aside but should be used when and if indicated.

The type of joint to be manipulated should be carefully selected, and only after a complete history has been taken and a thorough physical examination made, including x-ray and other laboratory studies, should manipulation be undertaken. All foci of infection must be diligently sought and properly treated.

The most suitable condition for manipulation is the chronic sprain or strain. This may be the result of acute trauma or may be associated with long-continued overstrain, as in foot strain.

Some acute conditions are definitely improved and some are completely relieved by this treatment. Relief has been observed in acute lumbago and in torticollis resulting from spasm. Another acute condition is the locking of a joint. It is my opinion that there is an occasional slipping or locking of the lateral facet of the fifth lumbar vertebra on the sacrum, associated with immediate excruciating pain and muscle spasm. This may occur when one is stooping over a wash basin or flexing the spine while in a squatting position. The relief obtained by a simple manipulation even without anesthesia, if done promptly, is often dramatic.

Hysterical conditions, such as hysterical pes varus, hip contracture and torticollis, may be temporarily or permanently relieved, but relief cannot be definitely relied on.

Manipulative treatment for arthritis, other than traumatic arthritis, is not generally successful, the disease is for the most part a degenerative condition and subject to frequent acute exacerbations. However, in many instances manipulation will afford temporary relief if followed by appropriate after-treatment. As a general rule, rheumatoid and chronic infected joints are not much benefited, and the reaction that follows may cause even greater stiffness.

Among the contraindications to be considered is, first of all, tuberculous arthritis. At no time in any stage of this disease should the joint be manipulated. It is for this reason that manipulation of joints is rarely indicated in children; there is always the possibility that the involved joint may be tuberculous.

* Read at the Twenty-first Annual Session of the American Congress of Physical Therapy, Pittsburgh, Pa., September 11, 1942.

Osteoporosis in the senile and bone atrophy following prolonged immobilization may result in fractures. Bone cysts or metastatic tumors may also cause this unfortunate catastrophe.

Aside from the contraindications mentioned, failure of manipulation may arise from faulty technic, that is, the use of too much force, so that excessive reaction is followed by increased fixation; failure to manipulate with sufficient force and in the right direction; insufficient anesthesia, with resultant imperfect muscular relaxation, or inadequate and improperly supervised after-treatment.

The manipulation itself, while a relatively simple procedure, requires some practice and experience. It is apparent to any golfer that the swing and necessary "follow through" can never be obtained by reading and observation. It is as necessary in manipulation as in golf that the operator get "the feel of it."

Anesthesia should always be induced. It is indicated for two reasons—to render the procedure painless and to secure adequate relaxation. Nitrous oxide oxygen and ether or pentothal sodium may be used. In my experience, pentothal sodium has been satisfactory. Gas and ether, pushed to the stage of complete relaxation and then discontinued, is also to be recommended.

Manipulation in general calls for the use of considerable force, probably more than the operator realizes. The use of extreme force, however, is never necessary and will only result in injury to the bones, muscles, blood vessels, nerves and other important structures. Shorter leverage is often indicated when longer leverage might produce damage.

The patient should be placed on a table, preferably covered with a soft sponge rubber mat. If the table is too high, so that proper leverage in manipulation of the lower extremity and back cannot be obtained, the operator should stand on a stool. The part to be manipulated is grasped and the joint forcibly moved until the adhesions are felt to give way or until the part has been slightly carried beyond the normal range of motion. The tearing or rupture of adhesions is often heard, while invariably the sensation of giving away will be imparted to the experienced operator's hands. The manipulative movement should be continuous and steady rather than jerky and abrupt. This causes a parting of the adhesions rather than a stretching. When the adhesions are dense, the joint fixed and definite resistance to manipulation encountered, it is good judgment to refrain from a complete manipulation at one time. It is far better to perform a series of manipulations than to run the risk of severe reaction and shock by attempting too much. It is then advisable to wait for a quiescent period following appropriate interval treatment.

The after treatment is most essential, and the success or failure of appropriate manipulation may depend on the manner in which it is carried out.

After certain manipulations some pain is experienced. This can be controlled by rest and sedation. Fixation should not be used if it can possibly be avoided. In some cases, temporary fixation in the corrected position may be necessary; in other cases, as about the knee joint, where there may be some effusion, roller cotton and a bandage may be applied for compression. However, it is extremely important that the radius of increased activity of the joint, obtained by the manipulation, shall not be lost. It is therefore imperative that the joint be moved as early as possible. Physical therapy should begin on the following day. Radiant heat and massage are a valuable preliminary treatment before passive and active motion. Active exercises are by far the most important and should form the basis of the after-treatment. The patient must be made to understand that a reasonable amount of discomfort may be expected. The average patient will not carry the exercises too far, but it is always well to note whether there is an undue inflammatory reaction. If so, the exercises should be moderated but nevertheless continued.

As the pathologic picture in a joint following manipulation is practically identical with that following acute trauma, it might be well to revise the treatment of acute sprains by more active mobilization and thereby prevent the adhesions and prolonged disability.

In view of the scope of the subject, it will be impossible to discuss the manipulative procedure relative to all joints amenable to such treatment. Therefore, only the manipulative treatment of the ankle, foot, knee, back and shoulder will be considered.

Ankle and Foot

Exclusive of limitation of the ankle due to osseous fixation, there are two chief causes to consider. First of these is synovial adhesions or scarring of the capsule and periarticular adhesions in and about the tendon sheaths. Fractures into or about the joint, such as Pott's fracture, with prolonged immobilization may also cause stiffness and limitation of motion. This limitation need not be marked to give rise to considerable disability. The foot, because of definite susceptibility to strain, offers a useful field for manipulation and should be accorded this type of treatment much more often than has been the usual practice.

It will be necessary first to revise some of the prevailing ideas concerning so-called flat-foot. It must be remembered that while the arch is maintained in part by ligaments, it is the function of the muscles to withstand continuous strain. Therefore, the arch should be under such muscular control as to be raised or lowered at will. In cases of chronic foot strain due to faulty musculature, the strain of the body weight on shortened ligaments tends to produce thickening and fibrosis, resulting in adhesions about the midtarsal joints.

Foot strain has been treated by the use of various supports with somewhat indifferent success. The principle in this instance is to prevent the foot from flattening, thereby avoiding painful strain. This, of course, is an unnatural procedure. On the other hand, if adhesions are broken down by manipulation and the foot rendered supple, there is no resistance when the foot is pressed down and therefore no strain, with its attendant pain. It is not necessary to attempt to restore the arch *per se* or to apply fixation in plaster.

The after-treatment is massage, with passive and active movements to begin on the day following manipulation and to continue for at least a month, the active exercises to be carried on indefinitely.

The technic of manipulation for foot strain is as follows: The patient is anesthetized on a firm table with his feet about 6 inches from the end. The surgeon stands at the foot of the table facing the patient's feet. The first maneuver is plantar flexion, then forcible adduction and inversion. This is followed by abduction and eversion and finally by dorsiflexion and eversion. This movement will require a lot of force and is best done by putting the shoulder behind the hand. The local reaction is usually slight, and there is usually no occasion to confine the patient to bed.

The Knee

Sprains of the knee joint are common and the resultant adhesions, both within and about the joint, often lead to prolonged disability. The injury is brought about by a forcible internal rotation of the femur on the tibia. As the force is continued, the internal semilunar cartilage is frequently torn from its periphery in its anterior two thirds, and since the posterior portion is fixed to the internal lateral ligament, as well as held down by the internal condyle of the femur, it tends to split and the familiar bucket handle detachment results.

The symptoms of derangement of the internal semilunar cartilage are well known, and when locking has occurred it must be freed at once by manipulation.

Just what happens to the cartilage as a result of the manipulation is a matter of conjecture, and whether or not the cartilage is restored to its former position is doubtful. What happens in many instances is that the mesial portion of cartilage is forced between condyles, although if sufficient clearance between the internal condyle and the tibia can be obtained, it may snap back against the outer torn edge. In any event, it rarely if ever becomes firmly attached, and a cartilage once displaced should be removed by operation. A condition, however, which should be constantly kept in mind is the possibility that the injury stopped short of actual tearing or derangement of the cartilage, resulting in a sprain of the internal lateral ligament. The clinical signs may strongly suggest cartilage injury, and many patients have doubtless undergone operation. Unless the proper initial treatment for the acute sprain is instituted, chronic disability will result from adhesions. It is this chronic type of condition that responds particularly well to manipulation.

The manipulative treatment is performed with the patient under anesthesia and is followed immediately by physical therapy consisting of massage and exercises.

The movements are as follows:

1. The surgeon grasps the leg above the ankle, and, flexing both leg and thigh, touches the back of the thigh with the heel, ending with a slight thrust.
2. The surgeon should then bring the head of the flexed tibia forward, either by grasping the upper part of the leg in both hands and pulling forward or by levering the head forward with the forearm behind the knee as a fulcrum.
3. The next movement is rotation of the head of the tibia. It is better to have the patient lying with his leg over the end of the table. With an assistant holding the thigh, the surgeon grasps the leg above the ankle with one hand and the head of the tibia with the other. The leg is then rotated in both directions, especially in external rotation.
4. Extension of the joint is then performed, preferably by the surgeon placing the heel on his own shoulder and clasping his hands over the front of the knee, pulling downward with one or two short pulls.

The manipulation for reduction of a fracture-dislocation of the internal semilunar cartilage is performed with the patient under anesthesia to relax muscle spasm. As a matter of fact, during anesthesia any movement may release the cartilage.

The usual manipulative procedure is to flex the leg on the thigh by grasping the leg above the ankle with one hand and the knee with the other. While flexing the knee, abduct the leg as much as possible, rapidly rotating the tibia inward and outward. This maneuver is followed by a rapid extension of the leg with inward rotation of the tibia. If these methods fail, the operator can place the leg between his thighs and, grasping the upper part of the tibia between his hands, abduct the leg with his thighs, at the same time rotating the head of the tibia inward and outward. The leg is then forcibly extended with a definite internal rotation.

The test of adequate reduction is that the patient can fully extend his knee. The patient can feel whether or not the reduction is satisfactory.

After reduction, a pressure bandage should be applied for twenty-four hours. Massage and active movements are instituted the following day and continued as long as necessary. If too much local reaction ensues, exercises should be moderated, but nevertheless continued.

The Spine and Pelvis

So-called "low back pain" has been a constant source of worry to the general practitioner and surgeon, who is almost daily confronted with this complex prob-

lem. When one considers the various etiologic factors which may enter into the picture, it is obvious that a careful clinical survey, including laboratory studies, should be made. As often happens, an exhaustive study may fail to reveal any definite abnormalities or lesions in the spine, pelvis or elsewhere. There is usually a history of sprain following acute trauma or a gradual onset associated with postural strain. It is this type of condition that is particularly favorable for manipulation, and one is always justified in performing this procedure, followed by appropriate physical therapy, before resorting to braces or operative measures.

Spinal arthritis, with or without sciatic pain, is often relieved by manipulation. This of course is only effective when periarticular inflammation and fibrosis are in part responsible for irritation of the nerve roots.

Manipulation of the back is preceded by a gradual stretching of the hamstring muscles, which in most instances are found to be taut. This is a gradual elevation and depression of the lower extremity, as follows:

1. With the patient fully anesthetized and lying on his back, the operator grasps the leg above the ankle with one hand and places the other hand over the front of the knee, thereby preventing strain on the knee joint. The extremity, in rigid extension, is then gradually raised and lowered by a pump handle motion. The movements must be gradual and never abrupt. They are to be continued until beyond 90 degrees at the hip. In my opinion, it is never justifiable to bring the foot over the shoulder, as has been recommended by some surgeons. The same procedure is performed with the other extremity.

2. The operator now places his forearm beneath the flexed knees of the patient and, with an upward swing of the thighs on the pelvis, flexes the lower spine, at the same time leaning forward so that the weight of his body rests on the posterior part of the thighs. He completes the maneuver by an upward tilt of the pelvis with his free hand.

3. The patient is now tilted on his side and the flexed lower extremity permitted to hang over the side of the table. The operator places his elbow and upper forearm over the buttock, at the same time grasping the patient's shoulder. The weight of the operator's body is now thrown on the forearm resting on the buttock, forcing that side of the pelvis forward, and simultaneously the shoulder is forced back, producing a twist, the so-called pelvic twist. The patient is again placed on his back, and the same maneuver is performed on the opposite side.

4. The patient is now turned on his abdomen, and the surgeon places his right forearm above the knees and raises the thighs. He then places the palm of his left hand over the lumbar spine, and with elbow straight gives a forward thrust.

The after-treatment consists of massage and exercises, beginning the following day and continuing as long as necessary. The routine exercises can be continued indefinitely with increasing benefit to the patient.

The Shoulder

Stiffness of the shoulder occasioned by trauma and resulting in periarticular adhesions or fibrosis is a rather common occurrence. The injury is usually sustained by a fall directly on the shoulder or transmitted by way of the hand or elbow. Adhesions may be secondary to dislocations of the head of the humerus or fractures in this region. Fixation may be so complete as practically to immobilize the shoulder and is often referred to as a "frozen shoulder."

It is necessary to differentiate between periarticular adhesions and injury to the supraspinatus tendon. This tendon is often ruptured and requires surgical

repair rather than manipulation. Bursitis involving the subacromial or subdeltoid bursae likewise respond to surgical rather than to manipulative procedures.

Osteoarthritis of the shoulder joint does not, as a rule, respond well to manipulative treatment.

Considerable care must be exercised in manipulating a shoulder, as fracture of the surgical neck or dislocation of the head of the humerus may occur. In cases of mild adhesions, it is possible to carry the arm through complete abduction, with the patient under anesthesia, without danger. In all cases in which the arm has been immobilized over a long period, it is much safer to use short leverage and to do repeated manipulations followed by physical therapy rather than to attempt too much at one time. Some of the most obstinate conditions will improve with a carefully planned series of manipulations.

In the manipulation of the shoulder, it is necessary first to loosen the joint by traction. Fixation of the scapula is also necessary. After traction and rotation, the arm is adducted to the midline and again rotated. With the scapula still fixed, flexion and extension are performed, the arm being rotated after each motion. This maneuver is followed by abduction, the assistant placing his fist in the axilla as the arm passes above the level of the shoulder, to prevent dislocation of the head, at the same time fixing the inferior angle of the scapula. At the height of abduction, the arm is again rotated. The scapula is now released and circumduction carried out through a gradually increasing radius of movement; at the same time internal and external rotation of the humeral head is performed. This is a valuable motion to break up adhesions. The patient should then be placed in bed with the arm tied to the head of the bed in abduction and external rotation, a position which is invariably impossible prior to manipulation. This is done chiefly for its psychologic effect, but if it is too painful a compromise position may be permitted. Baking, massage and exercises should be begun after twenty-four hours and be continued as necessary. Younger patients are more likely to cooperate than older ones.

Conclusion

Manipulation of joints for the reduction of adhesions in and about joints is a simple and valuable procedure, which should be employed much more frequently.

The manipulation of the foot, for foot strain, followed by appropriate physical therapy, is worthy of consideration.

Every patient should have the benefit of careful study, including a roentgenogram, before manipulation is attempted.

Earlier mobilization of sprains and fractures will do much to prevent the formation of adhesions, with their resultant disability.

The knowledge of when and how much to manipulate is acquired by experience and practice. In some instances, it is better to perform a series of manipulations; in others, manipulation is contraindicated and surgical procedures or orthopedic appliances should be used instead.

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Dr. Wilton H. Robinson (Pittsburgh, Pa.): You have heard a splendid presentation of the subject of manipulative surgery. I cannot discuss the paper thoroughly. The subject is too great. I would like to point out one thing, however. Manipulative surgery seems to be thought of as a new work. It is not new. It goes back as far as physical therapy goes, which is to the beginning of time. As you know, physical therapy was the first therapy there was. So manipulative surgery was the first surgery there was. It goes back to the reduction of dislocation of joints, the reduction of fractures and in later years to the correction of the clubfoot and congenital dislocation of the hip.

Manipulative surgery is a large field. It is greatly to be regretted that it has not received more systematic attention from the surgeons.

In the first place, it has been my experience that you cannot get the patients to take exercises if they have to take too many. For instance, for the foot, I seldom prescribe the use of more than three or four. They are selected carefully and one at a time is explained to the patient. I find the exercise much more effective than when I gave a long list. I formerly used thirty-five or forty-eight different exercises; they were printed and were in nice form, but I threw out all that and settled for a few good ones.

For the foot, the principal exercise is what we call the three in one. The patient sits with one knee crossing the other and bends the foot strongly inward to get the action of the anterior tibialis, strongly upward to get the action of the posterior tibialis and then complete relaxation of the foot and repeat. I give no exercises to affect the gastrocnemius. This will give you definite results in time.

The secondary exercise is what is called the scaphoid lift. You doubtless know these terms. In this the patient stands with the feet parallel and lifts the scap-

hoid, that is, the inner side of the foot upwards.

The third one is one that was shown by Dr. Fredette, but I think it is important. That is standing a distance from the wall, bending forward and touching the wall to stretch the heel cord strongly. The patient must be instructed not to do this energetically at first or he will hurt the gastrocnemius muscle and do no good.

It has always been my idea that the important exercise about the knee was the exercise of the quadriceps extensor muscle. I may be wrong, but I seldom use any other exercise around the knee. The patient is instructed to work the quadriceps extensor and move the patella up and down. I almost never use passive motion in manipulative work, but try to get the patient to take the exercises. I give simply flexion and extension.

Dr. O. L. Huddleston (Denver, Colo.): It seems to me that the subject of manipulation is one worthy of consideration by practically every one interested in physical therapy. The physicians in charge of physical therapy departments should prepare themselves to do that type of work, at least certain phases of it which do not require the use of anesthesia. I think we will find that we can increase the efficiency of our treatments materially if we judiciously employ manipulative procedures in conjunction with some of the rest of our work. The exercises that were demonstrated today were certainly worth while.

Dr. John W. Fredette (closing): I do not feel that Dr. Robinson and I are in disagreement at all about the exercises. There were a number depicted here on the screen, which covered a wide range of exercises that can be employed, but I think the important thing is to see that the patient does those exercises and to stress the importance of the exercises if he is going to have relief from a manipulative procedure.

Physiologic Basis for Treatment of Paralyzed Muscle — Hines, et al.

(Continued from page 73)

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NEED FOR PHYSICAL THERAPY TECHNICIANS *

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Physical therapy has proved a necessary adjunct to medical and surgical treatment in the rehabilitation of injured persons. Physical therapy should be prescribed by a physician and administered by a trained physical therapy technician under medical supervision. War has created a shortage of these technicians. It seems advisable, therefore, to make an estimate of the need during this national emergency for physical therapy technicians in the Army General Hospitals, civilian hospitals, crippled children's schools and the Children's Bureau, United States Department of Labor.

The Surgeon General of the Army in August 1940 stated that the Army was "very anxious to make adequate preparation for physical and occupational therapy in Army Hospitals." In September 1940 one of us (J. S. C.)¹ published an estimate of the number of physical therapy technicians which the army would require if the United States became engaged in war. This article stated:

In any event an estimate of 300 general hospitals of 1,000 beds each for six field armies in a war of such severity as is occurring in Europe would not seem to be excessive.

This estimate was approved by the Surgeon General of the Army. A general hospital of one thousand beds is authorized to employ 7 physical therapy technicians. This means that in this war the army would require 2,100 physical therapy technicians when it reaches its full strength. The Surgeon General of the Army estimates that 778 physical therapy technicians will be needed up to Dec. 31, 1942.

In physical therapy departments in civilian hospitals the shortage is also acute. For instance, one large Chicago hospital has 2 registered physical therapy technicians, 1 practically trained physical therapy technician and 1 nurse. Apparently it has been absolutely impossible to replace the last-named 2 persons with registered physical therapy technicians, as this hospital would like to do. Similar situations prevail in many other hospitals.

In order to determine the civilian hospital needs for physical therapy technicians we made a study of the need for physical therapy technicians in civilian hospitals which have an average census of over 150 and which are registered by the Council on Medical Education and Hospitals of the American Medical Association.

It is realized that a "need" for these technicians is not necessarily the same as a "demand." The demand is governed largely by economic factors. It is determined by the price and the availability of the service rendered. The need for these technicians is a medical, not an economic, concept. It is not always a conscious need; the ordinary layman lacks the knowledge to define his own medical needs, and physicians in some localities regard physical therapy as a luxury, doubting that the benefits justify the expense, especially for patients of moderate means.

We agree with the statement of Lee and Jones² in their comments on the uses and limitations of their report on good medical care. They stated:

No judgment is offered in this report with regard to the immediate possibility of making

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a general application of good current medical practice to the needs of all the people. Even apart from the serious limitations imposed by economic considerations, it may be that we cannot achieve adequate medical care in our imperfect human society. The practice of medicine cannot rise far above the cultural level of the population it serves. "Public Health is purchasable," but the purchase involves a desire to purchase, the willingness as well as the ability to pay for it, and at least some understanding of what is being bought.

To estimate the need of physical therapy technicians in civilian hospitals with an average census of over 150 the following method was used: Fifty hospitals in different areas of the United States with an average census of over 150 were chosen which had good physical therapy departments (table). The ratio of the total number of physical therapy technicians employed in these hospitals to the total average census of these fifty hospitals was applied to all hospitals in the United States having an average census of over 150. It was estimated by this method that a total of 1,584 physical therapy technicians was needed in these civilian hospitals.

For the country as a whole we believe a supply of physical therapy technicians in excess of the number shown in our estimates is needed for civilian hospitals. Our estimates include only hospitals with an average census of over 150, but actually many hospitals with an average census much less than this have a need and a demand for physical therapy technicians. For instance, one hospital in Illinois with an average census of 88 employs 3 physical therapy technicians.

In determining an estimate of the number of physical therapy technicians for crippled children's schools we secured from the United States Office of Education, Federal Security Agency, Washington, D. C., its bulletin³ giving the number of crippled children enrolled in special schools in city educational systems in 1937-1938. The total number of crippled children in these schools was 25,236.

Sever⁴ recently stated that physical therapy is a fundamental necessity in schools for crippled children and should go hand in hand with academic training. He also asserted:

In general, there are too many cases of all types assigned to each physiotherapist, the average running from 10 to 98. Ten to fifteen cases to treat a day is enough, and ten is plenty, especially if there is no trained help to remove and reapply braces and other apparatus.

Applying Sever's high estimate of 15 children to 1 physical therapy technician, 25,236 crippled children in schools will need 1,682 physical therapy technicians.

When estimating the number of physical therapy technicians required in the United States in order to meet the needs of the services for crippled children we wrote the Children's Bureau, United States Department of Labor. This bureau replied:

After reviewing the provisions made in the various state plans, we believe that the Maryland program, with respect to the physiotherapy services, would probably be considered as the best plan submitted by any State agency inasmuch as it provides adequate field services by qualified physical therapy technicians as well as excellent physical therapy services within hospitals and institutions used for the care of crippled children. The number of physical therapy technicians referred to above as being employed under the State program covers only the number on the field staff and does not include any of those who may be employed in hospitals or institutions in Baltimore.

In Maryland for a registered number of 3,031 crippled children 7 physical therapy technicians are employed under the crippled children's program. It is believed that we can again make an estimate of the total number of physical therapy technicians needed for this program. The ratio of the number of physi-

cal therapy technicians employed in Maryland's crippled children's program to the number of crippled children in Maryland was applied to the total number of registered crippled children reported on state registers June 30, 1941 (307,478). It was estimated by this method that 710 physical therapy technicians were needed for this work. It is to be remembered that the physical therapy technicians employed in the Children's Bureau are for field service and are not for service in hospitals or in crippled children's schools.

Fifty Hospitals Having Good Physical Therapy Departments

Number of Hospitals	Average Census	Total Number of Technicians	Number of Hospitals	Average Census	Total Number of Technicians			
California								
1.....	213	4	28.....	207	4			
2.....	153	1	29.....	173	9			
3.....	199	2	30.....	196	2			
4.....	160	2	31.....	183	3			
5.....	150	3	32.....	647	7			
Colorado								
6.....	164	1	33.....	270	4			
7.....	162	1	34.....	381	3			
8.....	193	2	Ohio					
Illinois								
9.....	335	4	35.....	151	1			
10.....	153	3	36.....	373	3			
11.....	160	2	37.....	165	1			
12.....	455	7	38.....	153	1			
13.....	305	2	39.....	1,217	6			
14.....	410	3	40.....	196	3			
15.....	207	2	41.....	280	3			
Michigan								
16.....	186	1	42.....	248	2			
17.....	178	1	43.....	348	3			
Minnesota								
18.....	481	3	44.....	192	3			
19.....	368	2	Rhode Island					
20.....	216	6	45.....	358	8			
New Jersey								
21.....	170	3	46.....	409	2			
22.....	180	2	47.....	278	4			
West Virginia								
23.....	230	2	48.....	213	1			
24.....	191	2	Wisconsin					
25.....	181	3	49.....	669	5			
26.....	163	1	50.....	224	2			
27.....	211	2	Total	13,705	147			

Our estimate now shows the following totals:

United States Army General Hospitals.....	2,100
Civilian hospitals	1,584
Crippled children's schools.....	1,682
Children's Bureau, United States Department of Labor.....	710
Total	6,076

We realize the limitations of this study. The quantitative estimates of the need as given cannot be regarded as an immediate practical objective or as a rigid standard by which to judge the adequacy of local medical facilities. They are estimates computed for a standard community. We believe that if patients in the fifty listed civilian hospitals received the care given in hospitals by their physical therapy departments, other communities are entitled to the same care. We believe that the general interpretation of this study is a reasonable one: that the estimates given are valuable for a community planning adequate, medical

care and that these estimates must be taken into consideration in the problem of training an adequate number of physical therapy technicians.

Perrott and Dorn⁵ in a study of the imminent needs for hospital personnel in registered private and nonfederal governmental hospitals found that there were 110 physical therapy technicians needed to fill vacant positions for which funds are available and 137 to fill positions which will be created by the expansion of present facilities.

The Subcommittee on Physical Therapy of the National Research Council in a recent survey found the following demand for physical therapy technicians in the immediate future:

Bureau of Medicine and Surgery, United States Navy.....	0
United States Public Health Service.....	14
United States Veterans' Administration.....	70
Civilians (Perrott and Dorn ⁵).....	292
United States Army Medical Corps.....	778
 Demand total	 1,154



DISTRIBUTED BY THE NATIONAL SOCIETY FOR CRIPPLED CHILDREN, INC.

Poster distributed by the National Society for Crippled Children, Inc., to every college in the country.

If the estimates in this list of demands are correct, we believe that it is imperative to institute a broad program to encourage qualified persons to train as physical therapy technicians. The scholastic requirements for admission to a school for physical therapy technicians approved by the Council on Medical Education and Hospitals of the American Medical Association are (a) two years or sixty semester hours of college, including courses in physics and biology; (b) graduation from an accredited school of physical education, or (c) graduation from an accredited school of nursing. Most of the students for the courses for physical therapy technicians will have to come from the group of college students because there is an even greater shortage of nurses and the graduates of courses in physical education are in great demand for recreational services.

Two methods are being used now to overcome the immediate shortage of physical therapy technicians. First, the United States Office of Civilian Defense

in its bulletin "Volunteers in Health, Medical Care and Nursing" is providing for the training of volunteer physical therapy assistants. These assistants are to aid trained technicians but are not to assume any independent responsibilities for therapeutic procedures.

It is hoped that some trained physical therapy technicians who are assistants in large physical therapy departments of civilian hospitals will be relieved for services elsewhere by the use of these volunteer physical therapy assistants.

A second method to overcome this shortage is to increase the number of students in approved physical therapy courses by an educational campaign in colleges. The National Society for Crippled Children, Inc., is aiding this campaign by distributing to every college in the country a poster "The Nation Needs Physical Therapists" (figure).

After World War II there will be a greater need for physical therapy technicians for the rehabilitation of injured persons. Hence, now is the time to prepare for that emergency by seeing to it that facilities are made available to provide trained personnel to meet the need.

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ARCHIVES of PHYSICAL THERAPY

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. . . EDITORIALS . . .

THE WAR SERVICE RECORD OF THE MEMBERS OF THE SOCIETY OF PHYSICAL THERAPY PHYSICIANS

Recently a questionnaire was sent to all the members of the Society of Physical Therapy Physicians in order to determine their status with regard to the war effort. An analysis of these questionnaires has proved to be extremely interesting.

Twenty-five per cent of the members who replied were already in active service and an additional 10 per cent was apparently physically fit and expecting a call. All but three of the members who were on active duty with the Army or Navy were practicing physical therapy with the armed forces. Only one of these three had been given an unsatisfactory assignment and he was promptly reassigned to a suitable position in charge of a physical therapy department just as soon as the matter was brought to the attention of the personnel division of the service in which he was appointed. The other two members of the Society who were not doing physical therapy were in important executive positions and were apparently satisfied with their appointments.

Approximately a third of the members of the Society of Physical Therapy Physicians were listed as essential teachers and has been so classified by their draft boards. All of the men in this group were over age and probably would not have been called to active service in any event. An additional 8 per cent of the membership had been classified as essential teachers, but they were less than forty-five years of age and apparently eligible physically; however, these men were all in key teaching positions and it seemed likely that they would be of more value to the war effort in their teaching positions than they would be in active service.

An additional 23 per cent of the membership might be considered eligible for military service except for the fact that they were over the age of forty-five years. Finally, there was an additional 4 per cent of the members who had applied for active military service, but who had been rejected because of a physical disability even though they were less than forty-five years of age.

These figures indicate that the membership of this society is contributing extensively to the war effort. Already a fourth of the membership is on active duty, and a third of the group is in essential teaching positions from which it will be difficult to spare them, and the remainder of the membership is either over age or has been rejected for physical disability. This study indicates conclusively that the members of the Society of Physical Therapy Physicians are contributing extensively to the present offensive effort and that practically every man in the group is doing his share toward winning the war.

It is, however, apparent that there are not enough members in this society to meet the needs of the Army and Navy and that a large number of medical officers will have to be trained by the teachers among the group in order to meet the needs of the military services. It is particularly encourag-

ing to find that the members of the Society are being placed in the proper field of endeavor in military hospitals. In the only instance in which a member was apparently improperly assigned, he was promptly reassigned to a department of physical therapy as soon as the personnel division of his service was notified concerning the matter.

It is apparent that the members of this society can be extremely proud of its contribution to the war effort.

IMPROVING STANDARDS FOR PHYSICAL THERAPY TECHNICIANS IN MILITARY HOSPITALS

It is gratifying to learn that on Christmas Eve, President Roosevelt signed the Edmiston Bill creating a "Physiotherapy Corps" in the Medical Department of the Army. With the establishment of this new corps, the status of physical therapy aides in Army hospitals will be changed from a civilian one to a military one. Graduates of approved schools for physical therapy technicians will be commissioned as second lieutenants in the Army Medical Corps with the same pay and allowances as second lieutenants in other branches of the military service. Head physical therapy aides will be advanced to the rank of first lieutenant and it is expected that a few supervising physical therapy aides may be commissioned eventually as captains. The superintendent of physical therapy aides in the Office of the Surgeon General of the Medical Corps of the Army, Miss Emma Vogel, has been commissioned recently as a major and plans are now under way for organization of the new corps.

Until these plans are finally approved by the War Department, there may be a little delay in the appointment of new aides in the Army. Apprentice physical therapy aides will remain on a civilian status just as has been the case in the past, and they will not be commissioned or placed on a military status until they have completed successfully a six months period of apprentice training.

With the establishment of this new Physiotherapy Corps in the Army and the commissioning of physical therapy aides on the same basis as Army nurses, one more step has been made in the logical development of physical therapy on a sound basis in this war. Another encouraging event is the announcement by the Bureau of Medicine and Surgery of the Navy that it is planning to replace half of the hospital corps men now serving as physical therapy technicians in the Navy by WAVES. Although it was first announced that the minimal requirement for enlistment of a physical therapy technician in the WAVES would be graduation from high school plus three years of practical experience, it was later announced that the Division of Personnel of the Navy had been advised to accept in the WAVES as physical therapy technicians only persons who had graduated from approved schools. Furthermore, it is understood that if a physical therapy technician who has graduated from an approved school does have a college degree in addition, she will be eligible for commission as an ensign in the WAVES; and graduates of approved schools for physical therapy technicians who previously were registered nurses can be commissioned in the Navy Nurse Corps and then assigned as ensigns to Navy physical therapy departments. It is estimated that between 200 and 300 women who are graduates of approved schools will be needed to replace corps men in Navy hospitals. This is another step forward and should tend to improve the caliber of physical therapy in the Navy. Such progress is extremely gratifying.

THE PLIGHT OF THE MALE PHYSICAL THERAPY TECHNICIAN

It seems obvious that in military hospitals, just as in civilian hospitals, there will be a need for a certain percentage of well trained male physical therapy technicians who have graduated from approved schools for technicians and who have had preliminary training as graduates of college courses in physical education or as graduate nurses.

The present policy of the Army Medical Corps, therefore, seems somewhat shortsighted. With the establishment of the new Physiotherapy Corps in the Army, women only are to be commissioned in this corps. Furthermore, the Surgeon General's Office of the Army has announced that "effective March 31, 1943, appointment to the position of male physical therapy aide is no longer authorized. Appointments of men now employed in this position will be terminated not later than March 31, 1943." Thus male physical therapy technicians no longer can be appointed in the Army on a civilian status even though they may not be eligible for active military service, and the Army has closed the doors completely to civilian male physical therapy technicians and to the commissioning of qualified male physical therapy technicians in the new Physiotherapy Corps.

The only way a trained man can now serve in a physical therapy department of an Army hospital is as an enlisted man in case he is drafted and assigned to the hospital corps, and then he cannot even advance to a noncommissioned officer's grade except at the discretion of his commanding officer. Thus the Army has closed the doors almost completely on the qualified male physical therapy technician whom later it may find it will be needing badly.

In the Navy, opportunities are a little better and hospital corps men who are qualified physical therapy technicians can be given the grade of second class pharmacist's mate and, for the duration of the war, will have an opportunity to advance, after a sufficient period of service, to commissioned status as ensign, lieutenant (junior grade) or lieutenant (senior grade). But even in the Navy, which formerly employed only male physical therapy technicians, it has recently been announced that half of the male physical therapy technicians are to be replaced by women physical therapy technicians who will be enlisted or commissioned in the WAVES.

The male physical therapy technician would seem to be better off in the Navy than in the Army at the present time, and it would seem also that the Army might be wise to give more careful consideration to the possible employment of male physical therapy technicians and to the provision of suitable arrangements for the fair treatment of such men on a basis similar to that now provided for women physical therapy aides in the Army Physiotherapy Corps.



Dr. Walter John Turrell, 1865-1943

On January 29th, there came the cabled message of the death of one of the leaders of physical medicine in England. Walter John Turrell, born in Oxford on April 9, 1865, the son of Rev. H. J. Turrell, Master of Turrell Hall, was a scholar, due to background and inclination. He was educated at Turrell Hall and Exeter College, received his M.A. at Oxford in 1890, graduated in Medicine at the University of Oxford in 1892. One of his first writings was "The Importance of Pure Milk Supply." He was attracted at an early period to the study of therapeutic roentgen rays and electricity. He became physician in charge of the physiotherapy department of Radcliffe Infirmary, Oxford and consulting physician of the Oxford County and City Hospital, where he made extensive studies on the large clinical material. During the First World War he became a major of the R. A. M. C. in charge of the Physiotherapy Department of the 3rd South General Hospital at Oxford. In 1921 he acquired the Diploma of Medical Radiology and Electricity at Cambridge University. The first edition of his masterly volume, "The Principles of Electrotherapy and Their Practical Application" appeared in 1922 and the second in 1929. He wrote an extensive article on electrotherapy in the 13th edition of the Encyclopedia Britannica, also a study on John Wesley; Physician-Electrotherapist. While he spent all his life at Oxford, where between his periods of arduous work he enjoyed angling, sailing, cycling and skating, his reputation became international. He was elected President of the Electrotherapy Section of the Royal Society of Medicine, President of the Duchenne Society for the Advancement of Electrotherapy. He was a member and later an Honorary Fellow of the American Electrotherapeutic Association and received the Gold Key Award of the American Congress of Physical Therapy in 1933. He was always most cordial in welcoming visitors from the United States and his many American friends mourn with their British confreres over his passing away. Dr. Turrell leaves the memory of a full life, well spent in advancing the scientific progress of physical medicine.

George Washington Crile, 1865-1943

George Washington Crile, internationally known as a surgeon and as an original thinker in many lines of research, died January 7, at the age of 78, of subacute bacterial endocarditis. At the time of his death he was director of research of the Cleveland Clinic Foundation, of which in 1921 he was a cofounder.

Dr. Crile received the degree of Doctor of Medicine in 1887 at the University of Wooster Medical Department, now Western Reserve University School of Medicine, and took graduate work in Vienna, London and Paris. He joined the faculty of Wooster University in 1889 as lecturer and demonstrator in histology. He was professor of physiology from 1890 to 1893 and professor of principles and practice of surgery from 1893 to 1900. He served as professor of clinical surgery at Western Reserve University School of Medicine from 1900 to 1911 and as professor of surgery from 1911 to 1924, when he became professor emeritus.

A list of the honors bestowed on Dr. Crile, of his memberships and of the offices he held in scientific societies would be a long one, for his life was distinguished by its creative energy in the interests of his profession. Among the subjects of his research were the factors involved in circulation, respiration,

blood chemistry and the source of the body's energy. Notable among his many publications was "The Phenomena of Life," which attracted wide comment.

In 1940 the American Congress of Physical Therapy awarded Dr. Crile its highest expression of recognition, the Gold Key Award, stating that his "many contributions to the causes, nature, and surgical and physical treatment of disease have enriched medical science and benefited suffering humanity."

During the Spanish-American War, Dr. Crile was a brigade surgeon with the rank of major in Cuba and Puerto Rico. In 1915 he served in civilian capacity in the American Ambulance Hospital in Neuilly, France. In 1917 he was commissioned major in the Medical Officers' Reserve Corps and became professional director of United States Army Base Hospital No. 4, Lakeside Unit, which operated in France from 1917 to 1919. He was commissioned colonel in the Medical Corps of the United States Army in October 1918 and brigadier general in the Medical Officers' Reserve Corps in 1921. In November 1941 he was appointed honorary consultant to the Medical Department of the Navy.

In 1919 Dr. Crile received the Distinguished Service Medal and also became an honorary member of the Military Division, third class, Companion of Bath (British). In 1922 he was made a Chevalier in the French Legion of Honor.

Physical Therapeutic Procedures in Otolaryngology—Hollender

(Continued from page 92)

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MEDICAL NEWS

Testimonial Dinner to Dr. A. Bern Hirsh

In spite of storm and several important medical affairs on the same evening, approximately a hundred physicians turned out to pay homage to Dr. A. Bern Hirsh, former managing editor of the *New York Medical Week* and the *Journal of the Medical Society of the County of New York*, at a dinner held at the Savoy Plaza on January 28. Dr. Charles Gordon Heyd, Past-President of the American Medical Association was toastmaster. Among the speakers was Dr. Edward C. Titus who extolled the work of Dr. Hirsh in physical therapy. A commemorative booklet, signed by those present was presented to Dr. Hirsh.

Dr. Jones to Direct New Department of Physical Medicine

The establishment of a department of physical medicine at the Ohio State University, Columbus, with quarters on the first floor of University Hospital, has been announced. Dr. David E. Jones, clinical assistant in orthopedic surgery, University of Louisville School of Medicine, Louisville, Ky., has been placed in charge of the new department. According to President Bevis, the new hospital department has been created to give increased thoroughness in the preparation of medical students and supplementary medical therapy to selected outpatient department patients. A specialist in arthritis, Dr. Jones will participate in the arthritic clinic at the University hospital. Dr. Jones' many friends in the Congress wish him every success.

The Penna. Academy of Physical Medicine Elects New Officers

The new officers of the Penna. Academy of Physical Medicine are:

President: *Albert A. Martucci*, M.D.

Vice Pres.: *Alfred J. Treacy*, M.D.

Sec'y-Treas.: *Harold Lefkoe*, M.D.

The first meeting of the new year was a symposium on Rapid Rehabilitation Following Fractures of the Upper Extremity. The following papers were presented:

1. The Shoulder—*Harold Lefkoe*, M.D.
2. The Elbow and Forearm—*V. W. Murray Wright*, M.D.
3. The Wrist—*Louis Kaplan*, M.D.

The key note of the meeting was, "early physical therapy, even before reduction, if possible." Early institution of physical therapy results in a rapid return to previous duties.

For the duration meetings will be held alternate months rather than monthly.

HAROLD LEFKOE, M.D., Secretary.

Military Status for Female Physical Therapy Aides

In accordance with Public Law 828-77th Congress dated December 22, 1942, a military status is authorized for female Physical Therapy Aides in the Medical Department of the Army. All original appointments are made as Physical Therapy Aide with the relative rank of Second Lieutenant; salary \$1,800 per annum plus quarters and subsistence allowance.

An applicant must be a United States citizen who has graduated from a Physical Therapy course approved by the Council of Medical Education and Hospitals of the American Medical Association. She must have passed her 21st birthday but not passed her 45th birthday.

If you are interested in accepting a commission for an assignment wherever needed, the following form should be accomplished and returned to the Office of the Surgeon General, Washington, D. C., as soon as practicable:

S. G. 173-1/16/43 (Application Form).

Appointments to this position are made in the office of the Surgeon General.

ANNUAL CONGRESS ON MEDICAL EDUCATION AND LICENSURE

Program of Meetings to Be Held in Chicago, February 15 and 16

The Thirty-Ninth Annual Congress of the Council on Medical Education and Hospitals of the American Medical Association will be held at the Palmer House, Chicago, February 15 and 16. The Federation of State Medical Boards of the United States will participate in the congress. The program follows:

MONDAY, FEBRUARY 15, 10 A. M.

Report of the Council on Medical Education and Hospitals of the American Medical Association.

RAY LYMAN WILBUR, M.D., Stanford University, Calif. Chairman of the Council on Medical Education and Hospitals.

Education and the War.

EDWARD C. ELLIOTT, LL.D., Washington, D. C. Chief, Professional and Technical Employment and Training Division, War Manpower Commission.

Premedical and Medical Education as Related to the United States Army.

BRIGADIER GENERAL JOSEPH N. DALTON, Washington, D. C. Assistant Chief of Staff for Personnel, United States Army.

Medical Education as Related to the Procurement and Assignment Service.

HAROLD S. DIEHL, M.D., Minneapolis. Member, Directing Board, Procurement and Assignment Service for Physicians, Dentists and Veterinarians.

Graduate Education and the War.

DONALD C. BALFOUR, M.D., Rochester, Minn. Director, Mayo Foundation for Medical Education and Research.

MONDAY, FEBRUARY 15, 2:15 P. M.
MEDICINE AND THE WAR

COL. GEORGE F. LULL, M.D., Washington, D. C.
 Chief Personnel Division, United States Army Medical Corps. (Representing the Surgeon General of the United States Army.)
REAR ADMIRAL ROSS T. MCINTIRE, M.D., Washington, D.C.
 Surgeon General, United States Navy.
THOMAS PARRAN, M.D., Washington, D. C.
 Surgeon General, United States Public Health Service.
Medical Licensure and Civilian Medical Needs.
HARVEY B. STONE, M.D., Baltimore.
 Member, Directing Board, Procurement and Assignment Service for Physicians, Dentists and Veterinarians.

Mobilization of Canada's Health Resources for War.
THOMAS C. ROUTLEY, M.D., Toronto, Ontario.
 General Secretary, Canadian Medical Association.

THE FEDERATION OF STATE MEDICAL BOARDS

MONDAY, FEBRUARY 15
FEDERATION DINNER

6:30 P. M.

Medical Schools in Wartime.
WILLARD C. RAFFLEY, M.D., New York.
 Dean, Columbia University College of Physicians and Surgeons.
Presidential Address.
JULIAN F. DUBOIS, M.D., St. Paul.
 Secretary, Minnesota State Board of Medical Examiners.
Round Table Discussion—State Board Problems.

TUESDAY, FEBRUARY 16, 9:30 A. M.

Medical Licensure in New York State.
ROBERT R. HANNON, M.D., Albany, N. Y.
 Secretary, New York State Board of Medical Examiners.
Medical Licensure and Public Health.
FELIX J. UNDERWOOD, M.D., Jackson, Miss.
 President-Elect, American Public Health Association; Secretary, Mississippi State Board of Health.
Necessary Legislation for Graduates of Accelerated Medical Courses and Temporary Interstate Relocation of Physicians.
J. W. HOLLOWAY, JR., Chicago.
 Director, Bureau of Legal Medicine and Legislation, American Medical Association.

TUESDAY, FEBRUARY 16

FEDERATION LUNCHEON

12:30 P. M.

TUESDAY, FEBRUARY 16, 2 P. M.

Basic Science Laws, Boards and Practices in the United States.
ORIN E. MADISON, PH.D., Detroit.
 President, Michigan State Board of Examiners in the Basic Sciences.
Materia Medica and Therapeutics: The Inadequacy of Present Day Instruction.
ADAM P. LEIGHTON, M.D., Portland, Maine.
 Secretary, Maine Board of Registration of Medicine.
Uniform Interstate Endorsement as a War Emergency Measure.
 Speaker to be announced.
Business Session.

The Fifteenth Anniversary Number of the Hebrew Medical Journal

A special issue of The Hebrew Medical Journal (Harofe Haivri), a semiannual, bilingual publication edited by Moses Einhorn, M.D., appeared late in 1942 to commemorate the fifteenth anniversary of the journal. It is dedicated to a symposium on peripheral vascular diseases.

Contributors to the symposium are Dr. Leo Buerger, who has written an editorial on "Peripheral Vascular Disease in Retrospect;" Dr. William

Bierman, "Physical Therapy in Peripheral Vascular Disease;" Dr. Charles F. Bolduan, "Some Data on the Prevalence of Diseases of the Peripheral Vascular System;" Dr. William S. Collens, "Arteriosclerosis Obliterans;" Dr. Aaron Dubno, "The Role of Vitamins in the Etiology and Treatment of Peripheral Vascular Diseases;" Dr. Charles Goodman, "Thrombo-Angiitis Obliterans and Typhus Fever;" Dr. David W. Kramer, "Gangrene of the Lower Extremities: Consideration of and Differential Diagnosis;" Dr. Samuel Silbert, "Treatment of Thrombo-Angiitis Obliterans."

This issue of the journal also contains an article by Dr. Milton B. Ashell on "The Practice of Dentistry Among the Ancient Hebrews," and Dr. Morton J. Robbins has brought to light an old Hebrew manuscript, "Physician's Prayer."

Dr. Menninger Assigned to Active Duty

Dr. William C. Menninger, Topeka, Kansas, has been commissioned lieutenant colonel in the U. S. Army Medical Corps and assigned to duty as consultant in psychiatry.

Refresher Course in Laryngology, Rhinology and Otology, March 22 to 27, Inclusive, 1943—University of Illinois College of Medicine

To meet the needs of ear, nose and throat specialists who, under existing conditions, are able to devote only a brief period to postgraduate review study, this didactic and clinical course has been arranged. Registration is limited. The fee for the complete course is \$50.00. In letter requesting application for registration, state school and year of graduation, also details concerning specialty training and experience. Address Department of Oto-Laryngology, University of Illinois College of Medicine, 1853 West Polk Street, Chicago, Illinois.

Ontario Dental Association

The 76th Annual Convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, Ontario, May 17, 18, 19, 1943. Dentists from the United States and from all parts of Canada will be welcome.

Kenny Course to Open in New York City With Miss Kenny Aiding Instruction

The Kenny method of treatment for infantile paralysis will be taught to physical therapists in the East for the first time at New York University under a grant of the National Foundation, it has just been announced jointly by Dr. Harry Woodburn Chase, chancellor of the University, and George L. Shearer, chairman of our Greater New York Chapter.

Miss Elizabeth Kenny, discoverer of the technic of treatment which bears her name, will be among the instructors for the courses, which will be

given by the University's School of Education in cooperation with the College of Medicine.

The program will begin on February 3 and extend through the second semester at the College of Medicine, 477 First Avenue, New York City, with clinical instruction at the Medical Center, Jersey City, and at other hospitals in the metropolitan area which have infantile paralysis patients.

Because of the acute shortage of physical therapy technicians created by the war, instruction will be given in the late afternoons and evenings so that technicians employed in this area may continue with their regular work while undertaking the training, according to Dr. George G. Deaver, director of the physical therapy curriculum at the School of Education, who will also direct the new program.

Instructors will include, in addition to Miss Kenny and Dr. Deaver, Dr. William Bierman, assistant clinical professor of therapeutics at the New York University College of Medicine, clinical director; Dr. Joseph Pick, assistant professor of anatomy at the University's College of Medicine; Miss Ruth F. Bergmann, chief Kenny technician at the Jersey City Medical Center; and a group of prominent physicians familiar with the Kenny method, headed by Dr. Don W. Gudakunst, Medical Director of the Foundation.

Dr. Currier McEwen, dean of the University's College of Medicine, said that it was important for doctors, nurses and physical therapy technicians to be prepared to give the Kenny treatment to patients who may be affected during the coming summer.

"Physicians and public health officials fully expect this part of the country to suffer an increase in cases during 1943 in keeping with the cycle trend of the disease," Dean McEwen said.

"The Kenny method of treatment cannot be successfully or even safely attempted except at the hands of especially trained persons. Thus far most of those wishing to obtain this training have had to go to the University of Minnesota where Miss Kenny has been teaching and we are glad that it will now be available in New York City.

"Miss Kenny will be here for much of the teaching program. Outstanding medical authorities likewise will be brought here from other universities. Prominent physicians of New York City, all familiar with the Kenny method, will also take part in the teaching program."

In acknowledging the grant from the Greater New York Chapter of the Foundation, Dean E. George Payne of the University's School of Education said that the institution was grateful for the opportunity to play a part in the fight against infantile paralysis.

"The grant represents a portion of the money given by the people of New York to the cause through the March of Dimes and the Celebration of the President's Birthday," he said. "Preparing hospital personnel to prevent crippling from the disease is a perfect way of returning to the people the maximum benefits from their gifts.

"The program will be open only to physical

therapists who are registered to practice their profession and who are graduates of approved schools of physical therapy," Dean Payne added. "Plans are under way to provide courses for doctors and nurses in the near future."

Three courses will be offered under the program. Dr. Pick will conduct a course on anatomy and kinesiology with lectures upon the anatomy of bones, joints, muscles and peripheral nerves and with demonstrations emphasizing topographical anatomy and the actions of muscles.

Dr. Bierman will conduct a course on present day concepts of poliomyelitis with a review of present day ideas, including the epidemiology, pathology, and differential diagnosis. The anatomic and physiologic basis for the Kenny technic will be discussed by special lectures from the research committees of the National Foundation.

The clinical work at the Jersey City Medical Center, under Miss Bergmann, will include demonstrations and actual practice on patients in the technic of the treatment. Sister Kenny and her assistants will conduct many of the demonstrations.

The program at New York University will be the most extensive yet undertaken and will mark the first time that Sister Kenny has left the University of Minnesota to appear on the teaching staff of another institution.

Inquiries should be addressed to Dr. George D. Deaver at the Washington Square Center of New York University.

Annual Report of Foundation for Infantile Paralysis

The National Foundation for Infantile Paralysis disbursed \$1,142,009.35 in seventy-seven grants and appropriations during the fiscal year ended Sept. 30, 1942. The money went to medical schools, hospitals, research laboratories, health institutions and foundations from funds raised by the "March of Dimes" and celebrations of President Roosevelt's birthday. During the year 450 county chapters of the foundation were formed, so that now 2,900 of America's 3,070 counties are serviced by about 40,000 volunteer workers. The foundation reports that its achievements during the year were the teaching of the Kenny method of treating after-effects, which entailed establishment of special training programs to provide physicians, nurses and physical therapists to apply and carry on the method; broadening of study in search of a prevention and real cure; addition not only to knowledge of the nature of the virus but also the method of spread of the infection, and reemphasis of the little appreciated role of "spasm" and other temporary symptoms which, if untreated, result in permanent damage and correlation of the study of infantile paralysis with studies of related encephalitis infections. For virus research the foundation made twenty-three grants to twenty-one institutions for a total of \$543,749.46. Of the grants, seven were to men or institutions whose work had not been previously supported by the foundation. Among the

grants were \$59,244 to Johns Hopkins University School of Hygiene and Public Health, Baltimore (the term of this grant is five years and the total approved for that period is \$300,000); \$40,000 to the University of Michigan School of Public Health, Ann Arbor; \$21,526 to George Williams Hooper Foundation of the University of California, San Francisco; two grants totaling \$21,310 to the Michigan Department of Health, Lansing; \$16,000 to Yale University School of Medicine, New Haven, Conn.; two grants totaling \$13,255.25 to the University of Minnesota Medical School, Minneapolis; \$12,400 to the Children's Hospital Research Foundation of the University of Cincinnati College of Medicine; \$10,860 to the University of Toronto Connaught Laboratories, Canada; \$10,035 to Stanford University School of Medicine, San Francisco, and \$10,000 to the University of Southern California School of Medicine, Los Angeles. To carry on after-effects work, the foundation made twenty-three grants to sixteen institutions in twelve states and Canada, among them being ten new grants. The total, including one appropriation, was \$88,286.33. Among the grants were three grants totaling \$11,893.38 to the State University of Iowa College of Medicine, Iowa City; \$9,200 to the University of Rochester School of Medicine and Dentistry, New York; two grants totaling \$7,975 to the Massachusetts General Hospital, Boston; \$7,050 to the University of Minnesota Medical School; two grants totaling \$7,000 to the University of Colorado School of Medicine, Denver, and \$5,900 to the Columbia University College of Physicians and Surgeons, New York. For educational purposes there were three appropriations and twelve grants to ten institutions in seven states, the total amount being \$227,540.80. Principal grants were \$6,000 to Teachers College of Columbia University, New York; three grants totaling \$34,280 to the National Organization for Public Health Nursing, Inc., New York; \$50,120 to the Georgia Warm Springs Foundation; \$16,695 to the University of Minnesota Medical School; \$10,400 to Northwestern University Medical School, Chicago; \$10,000 to the Harvard Infantile Paralysis Commission, Boston; \$9,520 to Stanford University School of Health (Women), Palo Alto, Calif.; \$5,000 to the American Physiotherapy Association, Palo Alto, and \$4,500 to the D. T. Watson School of Physiotherapy, Leetsdale, Pa. For epidemics and public health work there were five grants and eight appropriations totaling \$27,432.76. The grants were \$8,950 to the Illinois Committee on Infantile Paralysis in joint cooperation with the Cook County Public Health Unit and Illinois Department of Public Health, Chicago; \$3,600 to the New York State Department of Health, Albany; \$1,080 to the Children's Hospital, Winnipeg, Canada; \$940.72 to Vanderbilt University School of Medicine, Nashville, Tenn., and \$500 to the Louisiana State University School of Medicine, New Orleans. Among the miscellaneous appropriations was \$30,000 for operation of the infantile paralysis center at Tuskegee Institute, Alabama, which provides after-care for Negro or-

thopedic cases; also \$225,000 to the Georgia Warm Springs Foundation to conduct its work and research studies. To make the Kenny method of treatment available to patients in all parts of the country the National Foundation enlarged its training course at the University of Minnesota, added six courses at different centers throughout the country and set up scholarships for training physicians; nurses and physical therapeutists in this method.

Howard Atwood Kelly, 1859-1943

Howard Atwood Kelly, "father of gynecology," died in Baltimore January 12, aged 84, of generalized arteriosclerosis and uremia. Dr. Kelly was the first professor of gynecology and obstetrics at Johns Hopkins University, to which position he was called from the University of Pennsylvania School of Medicine, where he had been associate professor of gynecology and where he had received his medical degree in 1882. After 1899, when the department of obstetrics and gynecology at the Johns Hopkins University School of Medicine was separated into two divisions, he devoted himself to the development of gynecology.

Dr. Kelly is particularly noted for his revolutionary work in abdominal surgery and his contributions to the study of cancer and radiation. He invented the Kelly pad, rectal and vesical speculums and the Kelly operative technic. His extensive use of electro-surgery in his work served to advance its general use.

Elliott Gray Brackett 1860-1942

We regret to announce the death on December 29 of Dr. Brackett. He was a member of the American Academy of Orthopaedic Surgeons; fellow of the American College of Surgeons; at one time assistant in orthopedics at his alma mater, Harvard Medical School; served as a colonel and as a director of orthopedic surgery in the U. S. Army during World War I; one of the founders of the Industrial School for Crippled and Deformed Children; a trustee and the first president of the Boston School for Occupational Therapy; served as chief of the orthopedic service at the Massachusetts General Hospital and as assistant surgeon on the staff of the Children's Hospital. Dr. Brackett was the editor of the *Journal of Bone and Joint Surgery*.

Died in Military Service

Word has been received at the offices of the American Registry of Physical Therapy Technicians of the death of two of our registered technicians who were on active duty: Miss Lucille Cabeen, Head Aide, Station Hospital, Fort Bliss, Texas and Miss Frederika Campbell, Station Hospital, Port of Embarkation, New Orleans, La. Miss Cabeen and Miss Campbell were graduates of the physical therapy course at the Walter Reed Hospital, Army Medical Center, Washington, D. C.

BOOK REVIEWS

ORTHOPEDIC SUBJECTS. Prepared and Edited by the Subcommittee on Orthopedics Surgery of the Committee on Surgery of the Division of Medical Sciences of the National Research Council. Cloth. Pp. 306 with 79 illustrations. Price, \$3.00. Philadelphia: W. B. Saunders Company, 1942.

Dr. George E. Bennett of Baltimore is Chairman of the Subcommittee of Orthopedic Surgery. Its members are Le Roy C. Abbott, William Darrach, J. Albert Key, Guy W. Leadbetter, Frank R. Ober, Harold R. Conn, Robert H. Kennedy, Frederick C. Kidner, Paul B. Magnuson, M. N. Smith-Peterson and Philip D. Wilson. This committee wisely decided not to try to present orthopedic surgery. They are presenting in this manual some of the orthopedic subjects that are now of the greatest interest.

Section one by Dr. Paul B. Magnuson is a discussion on ununited fractures. It is divided into the following chapters: Fundamental principles and roentgenologic evidence; causes and preoperative care (Magnuson quotes a personal communication from Coulter on physical therapy preliminary to operation); mechanics of operation; treatment after operation and local anatomic treatment.

Section two is a contribution on injuries of the spinal column by Dr. Arthur G. Davis. It has chapters on generalities and classifications; compression fractures, fractures of special groups; dislocations and fracture dislocations.

Dr. J. Albert Key contributes the third section on compound fractures, in which he considers the treatment of compound fractures, the treatment of infected compound fractures and accompanying wounds as modified by war conditions.

Dr. Key has also written the fourth section on osteomyelitis. There are chapters on the following forms of osteomyelitis: Acute hematogenous, localized hematogenous, chronic diffuse hematogenous (sclerosing osteomyelitis of Garré); subacute infections of the bone (osteoperiostis albuminosa of Ollier) typhoid and the chronic form. He also gives the special operations for osteomyelitis.

Physical therapy physicians should be interested in this volume as orthopedic surgeons refer the majority of work to the physical therapy departments in general hospitals. This manual is highly recommended to all physicians.

BURNS, SHOCK, WOUND HEALING AND VASCULAR INJURIES. Prepared and Edited by Subcommittees of the Committee on Surgery of the Division of Medical Sciences of the National Research Council. Cloth. Pp. 272 with 77 illustrations. Price, \$2.50. Philadelphia: W. B. Saunders Company, 1943.

This is the fifth volume of a series prepared under the auspices of the various subcommittees of the

Committee on Surgery of the Division of Medical Sciences of the National Research Council. They furnish the medical departments of the United States Army and Navy with compact presentations of necessary information in the field of military surgery.

The subject of burns is presented as follows: The general treatment of the patient with a severe burn, by Henry N. Harkins, M.D.; the early local treatment of burned areas with special reference to war injuries, by Roy D. McClure, M.D., and Conrad R. Lam, M.D.; care of granulating surfaces; the early plastic treatment of burns, by Roy D. McClure, M.D., and Henry N. Harkins, M.D.; skin grafting for contractures following burns, by James Barrett Brown, M.D., which is well illustrated, and burns in chemical warfare, by David P. Barr, M.D. The importance of this chapter is realized when we think that every year approximately 6,000 persons in the United States die from burns. Of these deaths 60 to 75 per cent are caused by burn shock. Atkins, who had extensive experience with burned men evacuated from Dunkirk said that secondary shock is the most serious factor in burns and is responsible for 60 per cent of the deaths. Of all the causes of burn fatalities shock is not only one of the easiest to cure, but also to prevent.

The subject of shock has been edited by the Subcommittee on Shock of which Alfred Blalock, M.D., is Chairman. Norman E. Freeman, M.D., discusses the mechanism of shock; Alfred Blalock, M.D., considers the prevention and treatment of shock. In this section physical therapy physicians will be especially interested in the discussion on heat. Fluid replacement therapy in shock is presented by Max M. Strumia, M.D.

Wound healing is prepared by Allen O. Whipple, M.D., Chairman of the Subcommittee on Wound Healing of the Committee on Surgery of the National Research Council.

Vascular Injuries is prepared and edited by the Subcommittee on Vascular Injuries. John Homans is Chairman, Arthur W. Allen, Daniel C. Elkin, Geza de Takets and Walter G. Maddock are members. This section is illustrated and considers the following subjects: Scheme for treatment of hemorrhage; injuries of large arteries; injuries of arteries in special locations and diseases of arteries and diseases of veins. Under the treatment of thromboangiitis obliterans this committee recommended the use of the following physical methods: Rest, Buerger-Allen exercises for half an hour several times a day; the optimal degree of depression of the limb for comfort in sleep; applying dry heat to body and thighs; and the use of suction and pressure boot or intermittent venous hyperemia.

This military surgical manual can be highly recommended to all physicians as expressing the latest views of the best authorities on each subject considered.

GAS WARFARE. THE CHEMICAL WEAPON, ITS USE, AND PROTECTION AGAINST IT. By *Brigadier-General Alden H. Waitt*, Chemical Warfare Service, U. S. Army. Cloth. Pp. 327 with 50 illustrations. Price, \$2.75. New York: Duell, Sloan and Pearce, 1942.

Gas has been used in this war. At the last meeting of the American Medical Association there were shown photographs of Chinese burned by Lewisite used by the Japanese. In his recent book Dr. Lambie, medical missionary to Ethiopia, stated: "Early in the war, I asked the Government to get a large supply of gas masks, but they refused to do that. When the news of gas being used first reached them, they were unprepared." The author of this book calls attention that an extraordinary amount of misinformation has been published about poison gas so that the citizen is completely confused as to just what to expect in a chemical war. "He has begun to realize only now that it is important that he understand what poison gas is, how it may be used by an enemy, and what he should do if subjected to a gas attack."

The Medical Division of the Office of Civilian Defense realizes these facts and in their Operations Letter No. 46 state: "Information on war gases is supplied for general publication because of the possibility that they may at some time be used by the enemy. If people will remember a few simple facts, they will have no unreasonable fear of this agent."

This book presents the facts about chemical warfare in non-technical language. It acquaints the average military and civilian reader with the things he needs to know about chemical warfare. The average person is no longer interested in academic discussions as to whether gas warfare is humane or inhumane. None of the weapons of war are humane. The average citizen and soldier wants to win the war and if possible save himself from danger. He wants the plain truth about this weapon of war.

It is of interest to every physician that a doctor, Major General H. L. Gilchrist was a former Chief of the Chemical Warfare Service. During World War I, he was Chief of the Medical Division of the Gas Service in France. In a comparative study of World War I casualties, he joins other experts in putting mustard gas in first place as a war gas.

Shortly before the end of World War I, there was ready for shipment to France a supply of a vesicant agent which was believed to be superior to mustard gas. This agent, known as Lewisite, was first made by Capt. W. Lee Lewis of the Chemical Warfare Service, and of Northwestern University, Evanston, Illinois. Lewisite is somewhat heavier than mustard gas, has greater persistency, is much more irritating and more toxic. It is an arsenic compound and was called the "Dew of Death," because of the claim that two or three drops of the liquid on a man's skin would kill him. This claim is not greatly exaggerated, for experiments that have been made indicate that the absorption of Lewisite in a small skin area can be fatal.

To treat gas casualties the physician must know the physiologic action of these agents. They are classified as lung irritants—choking or suffocating

gases such as phosgene; vesicants—blister or skin irritants as mustard and Lewisite; lacrimators—tear gases; irritant smokes—sneezing gas or more irritants; nerve and blood poisons; and other gases such as incendiaries and screening smokes.

This volume also gives the use of gases in battle and protection and first aid. This book can be highly recommended to physicians.

GYNECOLOGIC SURGERY. By *Morris A. Goldberger*, M.D., F.A.C.S., Associate in Gynecology, Columbia University, N. Y., Associate Gynecologist, Mount Sinai Hospital, N. Y. Cloth. Price, \$2.00. Pp. 164. New York, Toronto and London: Oxford University Press, 1942.

In this book an attempt has been made to give a résumé in outline form of operative gynecology. It is not intended to replace any of the standard and illustrated works on gynecology or gynecologic surgery, but it is the hope that it may serve as a working guide to gynecologic surgery. All the facts have been presented briefly, but as completely as the limitations of the outline form would permit. There are 14 chapters including technic of general gynecologic surgery, external genitalia (vulva), vagina, cervix uteri, corpus uteri, prolapse of the pelvic organs, perineal lacerations, urinary incontinence, fistulas and others. Like the other books in this Oxford Medical Outline Series blank pages provide space for note taking and sketches. The book should prove useful to those who are interested.

THE MODERN HOME MEDICAL ADVISER. YOUR HEALTH AND HOW TO PRESERVE IT. Edited by *Morris Fishbein*, M.D. Cloth. Price, \$2.49. Pp. 907 with 135 illustrations. New York: Garden City Publishing Co., Inc., 1942.

This volume tells every intelligent person what he should know about medicine and hygiene. The editor has 24 collaborators, all of whom are teachers in medical schools or clinics and are authorities in their fields. This book answers the questions concerning the common illnesses that may develop in any family. Thus, all the common infectious diseases, deficiency diseases, disturbances of metabolism and digestion are discussed; also discussed are diseases due to disorders of the glands of internal secretion, to hyper-sensitivity and to industrial causes. There are special sections for such medical specialties as diseases of the skin, the eye, ear, nose and throat; prenatal care and the care of the child, selection of a suitable diet, mental hygiene; old age; the family medicine chest and the choice of a physician. It answers many questions that are put to the physical therapy physician, such as exercise in hygiene for women and in pregnancy; exercise in the care of the child; exposure of the baby to sunshine; sensitivity to heat, effort, cold and light; and exercise in diabetes and in old age. There are chapters on posture and the foot. This book can be highly recommended. No home should be without it. It gives the knowledge and experience of the best medical

men in the country on danger signals of diseases, emergencies and what to do for yourself or your children until the physician arrives.

PUBLIC HEALTH AND PREVENTIVE MEDICINE. By *Morton C. Kahn*, M.A., Ph.D., D.Sc., Associate Professor of Public Health and Preventive Medicine, Cornell University Medical College, New York City; Co-Director, Cuban National Anti-Tuberculosis Campaign. Cloth. Price, \$4.00. Volume I and II. Pp. 534. New York: Oxford University Press, 1942.

These two volumes form part of the Oxford Medical Outline Series. The author states that the science and practice of Public Health and Preventive Medicine has made such vast strides during the past two decades that the subject matter presented has made it necessary to utilize two volumes. The material is offered in three parts, environmental sanitation; transmissible diseases, and public health administration. Public Health and Preventive Medicine are becoming more important. Only by the prevention of disease in our armed forces and our civilian population will we be enabled to win World War II. When peace is declared the practitioner of Public Health and Preventive Medicine will be called to rehabilitate communities here and in the defeated countries. He will aid in preventing the introduction by our returning troops of tropical and oriental diseases which at present time do not exist. These two volumes are not a textbook on Public Health and Preventive Medicine as the subject matter is in outline form but they can be used as a supplement to a textbook as well as for lectures and for field work in Public Health education. They therefore can be recommended to students and to physicians who are beginning to be interested in Public Health.

INTRODUCTION TO MEDICAL SCIENCE ON A BASIS OF PATHOLOGY. By *Charles G. Darlington*, M.D., Professor of Pathology, New York University, College of Dentistry; Pathologist and Bacteriologist, Muhlenberg Hospital, Plainfield, N. J.; Pathologist, Beckman Hospital, New York; Pathologist, Somerset Hospital, Somerville, N. J.; Diplomat of the American Board of Pathology; *Grace G. Appleton*, M.A., R.N., and Director of Curriculum and Teaching, Muhlenberg Hospital, Plainfield, New Jersey. Cloth. Pg. 446. Numerous illustrations. Price, \$3.00. Philadelphia, Montreal and London: J. B. Lippincott Company, 1942.

This book furnishes, in the author's own words, "a connecting link between the basic sciences given in the nursing student's first term and the clinical courses in medical and surgical nursing which closely follows in her program." As a textbook it gives the student nurse an introduction to medicine on the logical basis of pathology. The book is divided into three parts. The first chapter is a short but interesting description of the highlights in the development of medical science. The remaining chapters of part one deal with the causes of disease and the bodily defenses against disease, basic general path-

ology, diagnostic procedures, a description of the various types of therapy and the control and prevention of disease. Part two is devoted to a description of diseases peculiar to various systems, with emphasis on pathology. Included is a chapter on specific infections and one on animal parasites. Due emphasis is placed on the more common diseases. Part three deals with diagnostic laboratory procedures. The authors recognize the fact that if the nurse has an understanding of why certain tests are done and what the physician expects to learn from them she will be better fitted to do her part in preparing her patients for tests and in collecting and caring for specimens. This section, therefore, integrates the principles and technic of laboratory record systems. The review questions at the end of each chapter are a direct teaching aid; the illustrations are good. Also, at the end of each chapter, is a preview of the vocabulary of the next chapter with aids in pronunciation. There is a good bibliography and index. The book is complete enough to serve not only as a text but also as a valuable reference work for the graduate nurse. It might well occupy a place in any ward library.

AFTER AFFECTS OF BRAIN INJURIES IN WAR. THEIR EVALUATION AND TREATMENT. By *Kurt Goldstein*, M.D., Clinical Professor of Neurology, Tufts Medical School. Cloth. Pp. 243, illustrated. Price, \$4.00. New York: Grune and Stratton, 1942.

This small monograph is written by a well known authority on neuropsychiatry. The book is based on the author's wide experience with a large number of cases of brain injury which occurred during the World War I. He had the opportunity of observing most of these patients over a period of ten years. The book is divided into seven main sections. In the section on general symptoms resulting from injuries to the brain, the author points out some of the physiopathologic features of injuries to the brain. He confirms or refutes certain commonly presented concepts concerning various reactions due to cerebral injuries which, heretofore, may have been only theoretical. In the section on neurologic symptoms, he discusses the reactions resulting from injuries to various parts of the brain, such as the motor area, sensory area, visual area, frontal lobes, cerebellum and distributor apparatus. He gives a clear and concise chapter on the mental symptoms resulting from injuries of different parts of the brain and the significance of studies of the mental symptoms made on patients who have these injuries.

In a long chapter Goldstein considers various laboratory examinations that can be made to determine the exact amount of damage to the brain from a psychologic standpoint. He points out the importance of certain tests and the disadvantages of others. In the chapter on treatment which constitutes the longest section of the book and which could only have been written by one who has had the wide experience of the author, he discusses the treatment of physical and neurologic changes and the symptoms occurring as a result of destruction of certain areas of the brain, such as the treatment of amnesia and aphasia, treatment of defects in speech,

treatment of disturbances in reading, writing and calculating capacity. Finally he considers the social adjustment of these individuals.

The book is well written and contains a minimal amount of extraneous material. It should be extremely important to anyone who may be connected with the treatment of such patients in the rehabilitation programs after the present war, whether he is a neuropsychiatrist, an internist or a physical therapist. In fact, the book should be read by all of these specialists in order that they may be acquainted with the various means of rehabilitation of persons who have severe disabilities as result of injury to the brain.

SILENT ENEMIES. THE STORY OF THE DISEASES OF WAR AND THEIR CONTROL. By *Justina Hill*, Associate in Urology, Medical School, The Johns Hopkins University. Cloth. Price, \$2.50. Pp. 265. New York: G. P. Putnam's Sons, 1942.

This is a popular yet scholarly book on the modern conception and treatment of diseases and other conditions related to or intensified by the war. The author is a distinguished bacteriologist at Johns Hopkins who had previously made her mark as a popular scientific author with a volume entitled "Germs and the Man." The world-wide scope of the present war should make men and women in the services and their families eager to get competent information on new tropical diseases, which have been discovered and on other infections and the newer methods of coping with them, as presented in the twenty-two chapters of the present book. Part I. Jungle Germs has chapters entitled: Around the World with Malaria; More Malaria; Man, Microbe and Mosquito; Yellow Jack. Part II. Out of the East Contains chapters on Typhus, Fleas Versus Lice; Plague, Rats and More Rats; Cholera; Assorted Nuisances. The chapters of Part III.: Through Shot and Shell, deal with Wounds and Wonders; Burns, Their New Importance; The Modern Magic of Blood Transfusion. The remaining sections are Part IV. Air Raid Shelters and Training Camps, Part V. Filth Diseases, Part VI. Control of Venereal Disease, Part VII. Versatile Viruses and Part VIII. Our present Status. The various chapters cover Influenza, Pneumonia, Diphtheria, Tuberculosis, Typhoid, Dysentery, Syphilis, Gonorrhea, Viruses in General, Encephalitis and Various other virus diseases. Medical men and nurses should also profit

by reading the up-to-date information and references in Miss Hill's book, which is written in an engaging style.

THE MAKING OF A SURGEON. A MIDWESTERN CHRONICLE. By *Ernest V. Smith*, M.D., D.Sc., F.A.C.S. Cloth. Price, \$3.00. Pp. 344. Illustrations. Fond du Lac, Wisconsin: The Berndt Printing Co., 1942.

In these days of critical social upheaval on the American scene it is refreshing to read how a young midwestern boy, orphaned at the age of seven without any funds for his education, was able to become a successful surgeon by sheer determination and hard work. Such is the story told in the first twelve chapters of Dr. Smith's autobiography. Ernest Smith was the son of a butcher, most of his family were farmers, so when left to provide for himself he worked first as a farm hand, saved enough money to enter a small college in Indiana, then earned his way working odd hours and nights as a grocery clerk, newspaper boy and dishwasher. After his graduation he went West and took turns as a miner, harvester and school teacher. In 1903, at the age of 25 he determined to become a physician. He accomplished his aim on "nothing a year" at the University of Minnesota by teaching at a Y. M. C. A. night school and later by a paid assistantship in histology and embryology. After five years of successful practice in a small Minnesota village he decided to take up surgery. He succeeded in enrolling in 1912 as a Fellow of the Mayo Clinic and ended there as first assistant of William J. Mayo, replacing Sister Joseph, who was Dr. Will's only assistant for nineteen years. From here it was but a natural sequence to the founding of a successful clinic at Fond du Lac, Wisconsin in partnership with other Mayo-trained medical men. The narrative is told against the lively background of the developing Midwest, the political struggles of the Nineties, the building of the first automobiles in Indiana and with a good picture of the Mayo Clinic and its influence on other physicians. The last chapters of the volume wander over the field of popular medicine with chapters on "cancer" humbug in medicine and surgery, "what kind of anesthetic," "how fees are divided" and "how surgeons are made," and contain a description of interesting cases from the author's clinic and a table of surgical cases. All of the latter appears rather anti-climactic in this interesting autobiography.



PHYSICAL THERAPY ABSTRACTS

Rehabilitation and Prehabilitation. Leonard G. Rowntree.

J. A. M. A. 119:1171 (Aug. 8) 1942.

A most illuminating article appeared recently from the pen of Dr. William A. Sawyer, Medical Director of the Eastman Kodak Company, Rochester, N. Y. In the article, Dr. Sawyer states, among other things, that: 1. The physical qualifications necessary to be an industrial worker are considerably less rigid than those demanded by our military forces. 2. The program of Selective Service bears a certain similarity to the industrial preemployment and replacement medical examination for the selection and classification of workers. Here there are four groups: I. Physically fit for employment—no defects or impairment. II. Physically fit for employment—minor defects, easily correctible. III. Physically fit for certain restricted employment. IV. Physically unfit for any employment (rejected). 3. In certain well organized plants, class II correctible defects are employed and followed up periodically while working until the condition has been taken care of adequately. 4. Industrial medicine comes nearer to preventive medicine than any other branch of the entire practice of medicine. 5. Under the ideal situation it is possible that industry could institute a more positive program on behalf of Selective Service. Industry could review all eligibles and offer examinations and advice concerning the correction of defects.

In this article Dr. Sawyer has dealt not only with the problem of incidence of disease but also with possible methods of meeting the situation adequately. He suggests a plan through which by foresight and planning the workman may have access to the best medical service in his home locality rather than to the cheapest.

Prehabilitation is a word coined by the Medical Division of the National Headquarters, Selective Service, to designate the correction of remediable defects prior to actual examination by Selective Service or the Army Examining and Induction Station. The plan is simple, is easily understood and can be readily carried out and should result in a pronounced diminution in the percentage of rejections and a proportionate increase in the number of men inducted into the Army of those physically examined.

The plan provides that (1) registrants familiarize themselves with the physical standards required, (2) that registrants apply to their local physicians and dentists if they fall short of the stipulated standards, (3) that family physicians and dentists correct defects if they are remediable and (4) that registrants carry certificates of prehabilitation to local induction boards at the time they present themselves for examination.

Scalenus Anticus Syndrome or Cervical Foraminal Compression. I. William Nachlas.

Southern M. J. 35:663 (July) 1942.

The syndrome of pains radiating to the shoulder and adjacent areas, for which the name "brachialgia" is suggested, is not a disease entity, but is the result of inflammation or pressure on the nerves in the cervical region.

The scalenus anticus muscle is not primarily responsible for the pressure phenomena and scalenectomy is not etiologic treatment.

The symptom complex is frequently observed and can be usually associated with lesions of the cervical spine that produce intervertebral foraminal compression of the nerve roots.

Treatment should be directed to the correction of the etiologic factor but, in addition to this, an effort should be made to relieve the pressure on the nerves at the cervical foramina. Since hyperextension of the neck opens these spaces, mechanical devices that can do this should be considered. Postural treatment in bed, strapping the neck in hyperextension and the Thomas collar are all useful. Physical therapy is quite helpful. In resistant cases the use of head traction is particularly valuable. After the acute stage is over education of the patient to proper posture with muscle training and rehabilitation are indicated.

Fatal Collapse Associated With Physical Exertion.

J. A. M. A. 119:1431 (Aug. 22) 1942.

Acute fatal nontraumatic collapse during indulgence in athletic sport or other strenuous exertion may occur with or without previous signs. An analysis by Jokl and Suzman of Johannesburg of 60 cases of sudden death in which clinical data and complete necropsy reports were available indicates the not unexpected conclusion that collapse associated with exertion is almost invariably due to circulatory disease of long duration. The following conditions arranged in order of frequency were found at necropsy: coronary artery disease, acute coronary occlusion, degenerative disease of the heart muscle, ruptured aneurysm of the aorta, chronic inflammatory disease of the heart muscle, ruptured aneurysm of the cerebral arteries, rupture of the heart, rupture of a congenitally diseased aorta, developmental abnormalities of the heart and developmental hypoplasia of the entire arterial system. They point out that arterial blood pressure rises physiologically during exercise and drops below the initial level during the rest period following exertion. In the cases studied, whenever the necropsy revealed that death had been due to rupture of diseased blood vessels the first symptoms of the collapse preceding death had set in

during muscular effort. During the negative phase after exertion, when the arterial pressure drops lower than the initial level, there is distinct danger to those who suffer from coronary and myocardial disease. In this group was a football player who lost consciousness after a game and died thirty minutes later. The authors believe that expiratory effort with a closed glottis represents the greatest physical stress with which the heart has to cope. The diffusion of oxygen through the lung is virtually suspended, and oxygen saturation of the capillary blood consequently decreases rapidly. The ultimate result is a pressure gradient apparently measured, as far as the coronary system is concerned, by the difference in pressure between the aorta and the coronary sinus and right ventricle. In subjects with coronary artery disease and deficient capillary supply of a hypertrophic myocardium, the physiologic phase often represents a catastrophic event from which the heart may never recover. The authors discuss a gastro-coronary reflex often present in strenuous exertion involving rise of intragastric pressure probably in the proximal portion of the stomach which, it is claimed, elicits a reflex constriction of the coronary artery circulation. They conclude from this and other work that any functional strain conceivable cannot cause fatal collapse but that certain diseases such as those enumerated render the heart and blood vessels so vulnerable that the physiologic effort associated with physical exertion may overtax their adaptive plasticity.

Electric Convulsion Therapy in Psychoses. Douglas Goldman, and E. A. Barber.

Am. J. Med. Sci. 203:354 (March) 1942.

The figures and clinical impressions from experience of the authors with this treatment lead to the following assertions: 1. Convulsion therapy with electric shock (as with metrazol) is effective in manic depressive psychoses of either manic or depressive preponderance, involution psychoses and in some catatonic states. 2. Convulsion therapy only occasionally produces lasting benefit in hebephrenic or paranoid schizophrenic patients. 3. The results are favorable in inverse proportion to the duration of illness. Duration over one year of any psychosis is likely to be unfavorable. 4. No unfavorable effects on the psychoses have been produced by the treatment but progress of deterioration in old patients has been unaffected. No clinical evidence of irreversible neurologic damage was encountered. Electric shock treatment was completed on 68 patients suffering from various psychoses. Nine were regarded as recovered; 13 had a "social remission"; 33 more were regarded as improved, and 13 as unimproved.

This method must still be considered experimental and must not be generally applied without great caution and circumspection. Patients submitted to the treatment should be observed for a long period afterward to determine the possibility of late complications. If these should be no worse than the effects of metrazol, electric

convulsion therapy must be considered a distinct adjunct to our present methods.

Psoriasis Vulgaris. Some Therapeutic Considerations. Thomas S. Saunders.

Northwest Med. 41:135 (April) 1942.

That psoriasis is an incurable disease is universally conceded. However, the greatest disservice a physician can do a psoriatic patient is to advise him that nothing can be done about his condition.

Psoriasis is said to be a disease of "healthy people" and such seems to be the case. Examinations of countless psoriatics have failed to reveal any direct connection with any other disease.

Chrysarobin, used in the treatment of psoriasis since 1878, remains the most effective single therapeutic measure.

Ultraviolet light is a valuable measure in most but not all cases. Seasonal (winter) recurrences seem to respond favorably to its action. The exposure should always be strong enough to provoke a moderate erythema about the lesions. The action of the light is enhanced by preliminary removal of scales and application of tar salves or tar lotions. This (the so-called Goeckerman) treatment is eminently satisfactory in extensive cases and particularly so, if the patient can be hospitalized.

Treatment of Vitiligo.

J. A. M. A. 119:1387 (Aug. 15) 1942.

To the Editor:—Kindly send information on the therapy of vitiligo with special reference to a stain to cover the blemish and the latest in vitamin or other therapy.

M.D., Wisconsin.

In the treatment of vitiligo, small areas may be colored with a solution consisting of sufficient bismarck brown, sufficient henna, carmine 5 per cent, fluidextract of walnut (*Juglans Nigra*) 20 per cent, aromatic spirit of ammonia 25 per cent and sufficient alcohol to make 100 per cent, which is applied coat on coat until the desired color is obtained. In some cases stimulation of pigment formation may take place after painting the lesions with 10 per cent of oil of bergamot in alcohol and then exposing the area to the quartz light. Vitamin C in large doses and injections of gold sodium thiosulfate in addition to many other measures have been recommended. Systemic treatment consists in the correction of any endocrine or metabolic disorders and the administration of iron or arsenic tonics. Yang [Acta dermat. venereol. 21:657 (Nov.) 1940] treated a group of cases with a gold preparation (lopion) given intradermally.

Unusual Reaction to Short Wave Exposure.

J. A. M. A. 120:412 (Oct. 3) 1942.

To the Editor:—Regarding the query entitled "Unusual Reaction to Short Wave Exposure" (The Journal, Aug. 1, 1942, p. 1154), while I was

treating a woman aged 27 for arthritic pains she occasionally became very anxious. She also complained of nausea and was afraid she would faint. As soon as the exposure was over (a 10 meter wavelength machine was used) she would feel better.

A. R. Aurello, M.D., Brooklyn.

To the Editor:—In the answer to a query about an unusual reaction to short wave exposure (The Journal, Aug. 1, 1942, p. 1154), it is stated that similar reactions have not been reported so far. Nevertheless it seems that they are not unusual at all. My attention was attracted to this subject by several radio operators serving on ocean liners. They complained that the transmission of messages by ultra short waves was followed by a feeling of drunkenness, disorientation and exceptional nervousness, while the same transmission under the same conditions but by medium waves did not produce any disturbance. One of these men had to walk on the ship deck for about two hours after his night service ended at midnight, but this occurred only after transmitting by short waves. After ten to fifteen minutes of intense short (4 meters) wave diathermy of the neck or shoulders, I occasionally observed vertigo and a feeling of drunkenness of short duration. One patient almost fell from his chair when the current was turned off. Years ago I read that carrier pigeons, if released in the vicinity of a short wave transmitter, circle around and start in the right direction only when the transmission is over. It seems that these manifestations have something in common which would be worth while investigating.

Paolo Ravenna, M.D., Chicago.

Electric Shock Therapy. Lucie Jessner, and V. Gerard Ryan.

From *Queries and Minor Notes*, in J. A. M. A. 119:602 (June 13) 1942.

To the Editor. — What is your opinion as to the present status of electric shock treatment for mental disorders? I have been consulted as to its value in a man of 50 who has been diagnosed as having general arteriosclerosis and in the last months has shown definite mental deterioration. He exhibits sexual perversions and definite changes in his normal behavior pattern which have necessitated his institutionalization. The institution in which he is confined has advised electric shock therapy. Before rendering judgment on this case I would appreciate your advice in the matter. — M.D., Hackensack, N. J.

Answer. — The electric shock treatment for mental disorders has largely replaced, in the last year or two, the use of insulin or metrazol to invoke a "shock." This is partly because, by the electrical method, the dosage is easily controlled, a factor long a deterrent in the use of other forms of stimulation. The dose can be graded until the best results are obtained without injury to the patient. Reports from various sources indicate that the effects produced on mental disease by electric shock are just

as good as those from insulin or metrazol. The method, therefore, can be used with a considerable degree of safety if employed by expert hands.

It is more difficult to decide whether a man of 50 with general arteriosclerosis is considered to be a contraindication for any sort of shock treatment; exceptions must always be made, depending on the amount of arteriosclerosis, the condition of the blood pressure, the general health of the patient and the persistence of his mental abnormalities. If arteriosclerosis is causing a permanent and progressive mental degeneration, no form of shock treatment is likely to be efficient. Such an estimation of the patient's condition should be made only after six months of observation in an institution, in the meantime the ordinarily employed forms of psychotherapy being used. If such treatment fails, electric shock should be taken into consideration as a second step.

All these factors must be carefully evaluated. More than one consultant may be needed. In general, one would feel that if the patient is under good institutional care the advice given by the psychiatrist in charge should have the most serious consideration in the final decision.

A review of the various types of shock and an estimation of their efficiency up to 1941 will be found in *Shock Treatment in Psychiatry*, by Lucie Jessner, and V. Gerard Ryan, New York, 1941. — (Reprinted with permission.)

Application of Heat for Shock.

To the Editor. — Although I prescribe conservation of body heat in the treatment of shock, this treatment is not compatible with my understanding of the physiologic basis of shock therapy. I realize that a subnormal temperature is common in shock; however, the body temperature can safely fall much lower than we see even in shock. If our chief object in the treatment of shock is to maintain ample blood supply to the brain and internal viscera, why should we bring this blood to the periphery by applying blankets and external heat? It would seem to me more advantageous to allow the body surface to be cool so that the blood supply could be shifted to the internal organs, even though it would result in a slight lowering of the body temperature. I would be interested in your opinion on this subject. — M.D., Atchison, Kan.

Answer. — The principle of conservation of body heat in the treatment of shock is established on the extensive practical studies made during the World War. Exposure to cold of soldiers in shock had a bad effect, and benefit was observed from the application of heat.

Superficially it may appear that cooling of the body of a person suffering from shock would be advantageous for the reasons stated in the inquiry; however, relatively little blood can be expressed from the skin by cooling because of the peripheral vasoconstriction present in shock. In fact, if cooling of the surface of the body is attended by a fall in body temperature of as little as 0.5 degree, shivering may be induced. This would greatly increase the expenditure of energy and increase the blood flow through skeletal muscle, which would be distinctly dangerous to the shocked person. Furthermore, as

the temperature of the body is reduced, hemoglobin holds oxygen more firmly. This would aggravate the anoxia that is present in shock.

Excessive warming of the body is also to be avoided for the reasons outlined in the question. The practical application of the principle of conservation of body heat in the treatment of shock is, therefore, not as simple as it appears. It is probable that the patient in shock unless his body temperature—not skin temperature—is below normal does not require an environmental temperature above comfortable levels. The coldness of the skin, a common indicator for the use of heat, is due to peripheral vasoconstriction. The use of extreme heat is undoubtedly harmful, and experimental evidence fails to show harm from cold. [Blalock, Alfred, and Mason, M. F.: A Comparison of the Effects of Heat and Those of Cold in the Prevention and Treatment of Shock, *Arch. Surg.* **42**:1054 (June) 1941]. A sound practical rule to follow in governing the covering and warming of persons in shock is to keep them warm and dry. — [Reprinted with permission, *J. A. M. A.* **119**:917 (July 11) 1942.]

Minimal Scarring After Electrodesiccation.
Thomas S. Saunders.

Arch. Dermat. & Syph. **45**:1165 (June) 1942.

As a result of practical experience, the author believes that the development of hypertrophic scars after electrodesiccation can be largely prevented (this does not apply to keloids, which are obvious idiosyncrasies). Frequent use of this modality has taught the author that the formation of hypertrophic scars usually results from improper technic. Rapid, intense destruction of a lesion with a hot spark seems to be almost always followed by a large, thick, elevated scar, particularly if the area is extensive. Conversely, the use of the smallest, "coldest" spark possible, with frequent interruption to allow the tissue to dissipate the heat, has almost always resulted in a flat scar of good cosmetic appearance. Such a technic is necessarily slow and time consuming, but the results justify the expenditures.

Pathologic Changes in the Brains of Dogs Given Repeated Electrical Shocks. **Karl T. Neu- buerger, Richard W. Whitehead, Enid K. Rutledge, Franklin G. Ebaugh.**

Am. J. Med. Sci. **204**:381 (Sept.) 1942.

The investigations of several workers indicate that the brain changes induced by electrical shock are partly due to the direct effect of the current on the brain parenchyma and partly due to the effect of the current on the cerebral circulation. The fact that the changes tend to be slightly more severe in the vicinity of the pathway of the current suggests the possibility that the current exerts a direct action on the brain parenchyma distinct from any effect on the circulation. The findings of Morrison, Weeks and Cobb, as well as those of Echlin, that the current brings about a contraction of the intracranial arteries, point to an involvement of the circulation in the patho-

genesis of the lesions. Petechiae and small foci of ischemic necrosis observed in the present work also suggest circulatory effects.

For a long time it has been known that rather marked cerebral changes are to be found in patients with epilepsy. Recent use of convulsive therapy has renewed interest in the effects of convulsions upon the architecture of the brain. Shock therapy with insulin or metrazol has been shown to be accompanied by more or less marked pathologic changes in the brain.

The present studies indicate that some degree of neuropathologic change is to be expected in animals given electrical shocks of the same strength and duration as those employed clinically. The results suggest that histologic changes induced by electrical shock in the brains of dogs are somewhat less severe than the changes that were found following the use of metrazol.

Rehabilitation of Head Injuries. **Wylie McKis- sock.**

Practitioner **149**:75 (Aug.) 1942.

The need of adequate facilities for the rehabilitation of patients who have sustained a craniocerebral injury is great and that attention has recently been focused on this subject is one of the more fortunate aspects of the present world war.

It must not be forgotten that rehabilitation begins with return to consciousness on the part of the patient. In the early hours and days of recovery much may be done towards achieving the best end-result and to this purpose there must be a team of persons at work together, each with his or her own field, and each ready to play the appropriate part of the correct moment.

Nurses should be specially selected, for it is on them that much hard work will fall and theirs is often a thankless task of considerable difficulty, as all who have had experience of the acutely irritated head injury will agree.

Porters or male nurses are often required and should realize that "main force" is the last of their requirements. They may be required to prevent violence on the part of the patient, but they should use physical restraint in as gentle and reasonable a manner as possible. Adequate treatment with drugs make their need an occasional one only.

The masseur is a valuable member of the necessary team from the early days of recovery until the end of the period of stay in hospital.

Although occupational therapy plays a part in the rehabilitation of patients with head injuries, it is perhaps not as important a part as that played in other branches of neurologic surgery. During the earlier period of recovery, while the patient is still confined to bed, some forms of occupational work may be given, compatible with the degree of mental ability of the patient, mainly with the idea of stimulating interest and occupying time. Such pastimes should be carefully chosen with regard to the personality concerned

and should lie always just within the powers of the patient without requiring too much effort at concentration. It is all too easy for these patients to lose interest from excessive effort being required of them and, if this takes place, harm rather than good has been done.

There can be little doubt that the cranio-cerebral injury falls within the province of the neurosurgeon and the neurologist, for, although the treatment is seldom actively surgical, the problems which frequently arise require that attention to detail and that understanding of the physiological principles of the working of the central nervous system in which the modern neurologist and neurosurgeon are trained over a period of many years.

The patient should from the first be led to believe that he will recover satisfactorily, for this is true of by far the great majority, and the minority who will retain some permanent defect must have their minds led into the most suitable channel.

When the patient begins to leave his bed, which may be a matter of a few days or many weeks, depending on the nature of the injury, the need for an organized time-table throughout the day becomes more apparent. Every effort should be made to stop the aimless wandering about the ward, the hospital or its grounds by recovering patients.

After the first few days of regaining their feet, light physical exercise may well be permitted and encouraged, gradually increasing both in extent and in vigor as the patient tolerates it. Definite duties should be assigned to such convalescents, either in the ward or in some other part of the building or hospital grounds. Due precaution must be taken at this period that no untoward symptoms occur and that the patient does not become excessively tired.

Primer on Arthritis.

J. A. M. A. 119:1089 (Aug. 1) 1942.

Treatment of osteoarthritis (hypertrophic, degenerative) includes: (a) The correction of body mechanics (posture) by proper rest positions, by corrective exercises for the body and by orthopedic braces and supports. (b) The maintenance of good circulation. The blood supply of the joints must be increased by all possible means if the permanent joint tissue changes are to be minimized. Rest and freedom from worry are important. (c) Dietetic errors, overexertion and gastrointestinal dysfunction all require steady care.

Pain may be controlled by the use of acetylsalicylic acid or other salicylates.

The local treatment of joints is aimed to reduce pain. Heat and massage with moderate voluntary exercise are useful in improving the local blood supply. One should, however, avoid massage of the tender osteoid tissue covering bony growths at the margins of the joints, as it is apt to cause more irritation and so increase their size and sensitiveness. Voluntary exercise is much better

than passive exercise for this reason though passive exercise may decrease the stiffness. Excessive exercise increases the stiffness. Local counterirritants may be used to relieve pain and cause hyperemia, such as analgesic balm and oil of wintergreen. Roentgen treatments have been used with reported relief of the pain in some joints, particularly the knees or the hips. They do not, however, change the bony exostosis but through the relief of pain may increase the range of motion if the chondroosseous edges are no longer sensitive.

Osteoarthritic joints require protection. Rest is essential, and, since this is a nonankylosing type of arthritis, complete rest in casts may be given without danger of permanent stiffness. Usually the joints are more limber after rest in bed or after the removal of plaster splints than before the rest was given.

Surgery may play a small part in the region of the knees and hips.

The After-Care of Amputations. W. R. D. Mitchell.

Practitioner 149:890 (Aug.) 1942.

Active exercising of the stump is started as soon as the wound is healed and free from tenderness. In uncomplicated cases this will usually be about three weeks after amputation. All joints of the stump are daily put through a full range of supervised active movements for short periods. Overtiring of the stump and the production of pain are to be avoided at all stages. Passive stretching will not be necessary if postoperative care has been adequate, but if any deformity has been allowed to develop it may succeed in overcoming slight degrees of hip or knee flexion. Movements at first will not be done against resistance, but later on, as muscle tone improves, the exerciser is of great assistance in promoting further development. When amputations below the knee are concerned special attention should be directed to the quadriceps. In the case of amputations through the thigh, the adductors and extensors of the hip-joint are the most important muscle groups.

Electrical Convulsion Therapy. R. E. Hemphill.

Lancet 2:6 (Aug. 8) 1942.

The results of treating 63 males and 137 females are shown. Cases have been classified in 5 diagnostic groups, but in the schizophrenic and affective illnesses only are numbers large enough to allow conclusions to be drawn. Under the heading "depression" are grouped melancholias and depressions, including involutional melancholia from whatever cause and depressive phases of the manic-depressive psychosis; the schizophrenic group has not been subdivided.

The criteria of results are four: complete remission of symptoms with the return of full working capacity; partial recovery sufficiently great to enable the patient to remain outside hospital; maintained improvement social or ideational in patients still hospitalized; no improvement. Of

the 200 patients, 20 men and 62 women were discharged from hospital; of these 12 men and 47 women made a complete recovery and none of these have since relapsed. This represents a discharge rate of about 40 per cent of all patients treated, irrespective of the nature or duration of the mental illness. It will be seen, however, that this figure is chiefly determined for the better by the proportion of affective psychotics treated and for the worse by the schizophrenics.

Electrically induced convulsion therapy is a safe and convenient method of physical treatment in mental disorders. It is highly satisfactory in affective reactions and especially in involutional melancholia, but it cannot be regarded as a specific, and to be successful should be accompanied by psychotherapy on general lines. Its value in chronic schizophrenic illnesses is towards promoting social improvement rather than cure; on recent cases its effect may be much more favorable. No doubt, as others have found, really early treatment brings about a fair percentage of recovery.

There were no immediate fatalities in more than 200 cases of mental disorders treated by electrical convulsion therapy, but unrecognized latent tuberculosis may have been reactivated in 3. Three fractures were seen: of the humerus, the neck of the femur and of the dorsal vertebrae. The only schizophrenics that recovered had been ill for less than a year. Spontaneous remissions were observed in 2 schizophrenics after unsuccessful shock treatment, and prefrontal leucotomy was responsible for improvement in 3 other shock treatment failures.

Management of Rheumatic Disease in the Forces. Oswald Savage.

Brit. M. J. 4263:336 (Sept. 19) 1942.

Fibrositis formed by far the largest group, being over 52 per cent of the total number of rheumatic cases. The term "fibrositis" as it is usually employed means a non-articular involvement of the soft tissues, most commonly the sheaths of the muscles, the fascial layers and other fibrous supporting tissues of the locomotor system. Cases of fibrositis should not as a rule be admitted to hospitals unless they require manipulation or intensive treatment. They should be capable of being rendered symptom-free by short periods of physical therapy and army life with its regulated activities and adequate food is often good treatment for them. Lowering the man's medical category was delayed until treatment had been tried. In the majority of cases it was found to be unnecessary.

Of 40 cases of lumbar fibrositis fourteen had acute lumbago and were admitted to hospital. Initial treatment in many cases was by local infiltration of 2 per cent procaine. This was followed daily by application of heat and a program of exercise.

Thirty cases of trapezial fibrositis were reported. The patients complained either of postoccipital pain and headache or of stiffness across the

shoulders accentuated by the wearing of equipment and by drill.

It is difficult to differentiate cases of gluteal fibrositis from the sciatic group as they both form part of the sciatic syndrome.

The symptom of shoulder-girdle fibrositis was of pain radiating from the shoulder down the outer side of the arm, often to the fingers, with some pain on full movement of the joint.

Postural backache is a relatively common condition. During the early weeks of training the men report sick with headache. These men were all treated by remedial exercises. Those not admitted were recommended to be sent to the army physical development center.

Twenty-four cases of sciatica were reported, all of which were admitted to the hospital. After a period of rest, infiltration with local anaesthetic was carried out and followed by physical therapy. In 3 patients with sciatica of long standing physical therapy failed to change the condition. Manipulation was followed by restoration of full function. The remaining 10 patients made slow but steady progress. They were treated by rest, splinting and physical therapy. When fit they were transferred to a convalescent depot for further exercises.

Ankylosing spondylitis (Marie-Strümpell disease) accounted for fourteen cases. This is a large proportion for a disease which is counted a rarity. It occurs almost exclusively in young men, and, therefore in the age group which was being examined. They were recommended for discharge from the Army.

There were four cases of rheumatic fever. The average age, twenty-five years, of this small group is high and in each instance the attack was a primary one.

Non-specific infective arthritis occurred in four patients. In these pain in the joint and moderate effusion were associated with a focus of infection.

Gonococcal arthritis accounted for three cases. Two of these were early, with urethral discharge and were transferred.

There were three patients with sacroiliac strain, all traumatic in origin.

Sodium Sulfathiazole Iontophoresis. James L. Boyd.

Arch. Ophth. 28:205 (Aug.) 1942.

Iontophoresis of a 5 per cent solution of sodium sulfathiazole with a low current (1 milliampere) for a short time (two minutes) when compared with use of a corneal bath of equal duration increases the sulfathiazole concentration of the cornea and of the aqueous humor by three times. With a current of 2 milliamperes the concentration in the cornea and in the aqueous humor is ten and nine times, respectively. Sulfathiazole concentrations varied directly but not proportionately with the strength of current and the time of application. No ocular damage was observed with use of a current that produces a satisfactory sulfathiazole concentration in the cornea and in the aqueous humor—i. e., a concentration consistent with optimal bacteriostatic effect.

Phyto-Photo-Dermatitis. Robert Klaber.

Brit. J. Dermat. & Syph. 54:193 (July) 1942.

The skin of sheep and cattle can be sensitized to sunlight by the ingestion of certain plants (Hypericism, Fagopyrism, Geelikkop, etc.). Photosensitization of the human skin may follow the absorption of certain pigments or drugs (acriflavine, haematoporphyrin, sulphanilamide, etc.). There is as yet no reliable evidence of human sensitization resulting from the consumption of any plant. External contact, however, with certain plants, or plant extracts, may lead to photosensitization in man.

The reaction which follows subsequent exposure to sunlight has certain special characteristics. The resulting eruptions are distinct from simple solar dermatitis. They are also quite distinct from most of the other eruptions which may be excited by sunlight. The only comparable reactions are those which have been produced experimentally after impregnating the skin with certain dyestuffs (cf. lipstick dermatitis).

Several observers have reported individual cases of pigmentary reaction to repeated exposures to ultraviolet rays after rubbing in bergamot oil.

The author, using a mercury vapor arc, has treated a number of patients in this way. Of these a small proportion, over a period of many months, have shown a slow though quite convincing improvement. This repigmentation may possibly be dependent on the oil having been rubbed in, instead of being left on the surface of the skin. On the other hand, it may possibly be attributed to the natural course of the disorder, which the writer believes is not always constant or progressive as is generally supposed.

The importance of the determination of the wavelengths responsible for exciting phyto-photo-dermatitis may be deduced from the Grotthus-Draper Law. This states that only those wavelengths which are absorbed by a system can produce photochemical reactions in that system. Conversely, those wavelengths which excite a photo-biological reaction, such as phyto-photo-dermatitis, must be absorbed before they can do so.

It has been shown (Guillaume, Kitchevatz) that the reaction depends on the prior impregnation of the skin by materials which are themselves inactive. It is therefore reasonable to infer that the effective wavelengths are absorbed by these materials. The determination of the absorption spectra of the photosensitizing extract and its derivatives should therefore confirm the effective exciting wavelengths, where these are uncertain. It should also provide unassailable evidence for or against any suspected photo-sensitizing agent.

A number of plants or their extracts appear to excite a contactdermatitis only after subsequent exposure of the skin to sunlight.

It is suggested that the resulting eruption be described as a phyto-photo-dermatitis.

Experimental studies and especially biophysical and biochemical investigations have only been carried out within the last few years.

These aspects of the subject, together with the

earlier history, geographical incidence and some of the botanical relation have been broadly reviewed.

Some personal observations and experiments are recorded.

Studies on Methods of Prevention of Epidemic Influenza. Joseph Stokes, Jr., and Werner Henle.

J. A. M. A. 120:16 (Sept.) 1942.

Although the bactericidal action of sunlight and ultraviolet light was known for many years, irradiation was not applied to the practical problems of air disinfection until rather recently in the work of Wells and Hart. Their studies were assisted considerably by the development of methods for determining quantitatively the contamination of the air by microorganisms. In the course of such studies it has been found that air borne influenza virus type A can be destroyed by such irradiation, and further that infection of mice with influenza A virus by the air borne route can be prevented by suitable irradiation of the inhaled air laden with virus.

Experimental evidence was obtained concerning three promising approaches to the control of epidemic influenza and in particular influenza A, namely (1) by disinfecting within enclosed spaces the vehicle, air, through which cross infections probably occur, (2) by actively immunizing susceptibles and (3) by passively immunizing exposed susceptibles with immune serum.

1. Studies were made concerning the comparative merits of ultraviolet light and propylene glycol vapor for disinfecting the air of influenza A virus and concerning the possible protection of individuals from cross respiratory infections by means of propylene glycol vapor.

2. A group of boys vaccinated against influenza A virus and a group of suitable controls were exposed to a recently isolated active influenza A virus by inhalation. Striking protection was afforded by the vaccine.

The Use of the Fluoroscopic Method for Diagnosis of M. Tuberculosis in Sputum. R. B. Dienst.

Am. J. Clin. Path. 12:61 (Sept.) 1942.

Samples of sputum from 50 clinically diagnosed cases of tuberculosis were examined by both the Ziehl-Neelsen technic and the fluoroscopic method. Also a number of samples of sputum from non-tuberculous patients were studied by these methods. The following conclusions were made from this study: The Ziehl-Neelsen method for detecting acid fast organisms in sputum is the more desirable one. Both technics were equally efficient in detecting acid fast bacilli in the samples of sputum from known clinical cases of tuberculosis. Samples of sputum from the non-tuberculous patients were diagnosed with more certainty when stained by the Ziehl-Neelsen technic. When smears showing no acid fast bacilli were prepared and examined by the fluorescence technic, the examiner had little assurance that the field was in focus.

Schools Approved for Training Physical Therapy Technicians by the Council on Medical Education and Hospitals

Name and Location of School	Medical Director	Entrance Requirements *	Duration and Time of Admissions	Tuition †	
			Regular Course	Emergency Course	
Children's Hospital, Los Angeles	Steele F. Stewart, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos. Feb. and Sept.	6 mos. Feb. and Sept.	\$200 R \$200 E
College of Medical Evangelists, Los Angeles....	Fred B. Moor, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos.	.....	.....
Stanford University California	William H. Northway, M.D.	(a) R. N. (b) Phys. educ. major (c) 3 yrs. coll.	12 mos. Jan. and June	7 mos. Jan. and June	\$429 R \$286 E
Walter Reed General Hospital, Wash., D.C.	P. A. Strickland, Jr., Capt., M. C.	Phys. educ. major	.....	6 mos. Quarterly	None
Northwestern Univ. Medical School, Chgo.	John S. Coulter, M.D.	(a) R. N. (b) Phys. educ. major (c) 3 yrs. coll.	9 mos. Oct.	6 mos. Jan. and July	\$200 R \$200 E
Bouvé-Boston School of Physical Education, Boston	Arthur L. Watkins, M.D.	High school grad.	3 yrs. 4 yrs. ‡ Sept.	6 mos.	\$400 R ? E
Harvard Medical School, Boston	Frank R. Ober, M.D.	(a) R. N. (b) Phys. educ. major 2 yrs. coll. §	9 mos. Sept. and March	6 mos. Sept. and March	\$200 R \$200 E
Boston Univ. Sargent College of Physical Education, Cambridge, Mass.	Louis Howard, M.D.	2 yrs. coll.	2 yrs. Oct.	||	\$547
University of Minn., Minneapolis	M. E. Knapp, M.D.	(a) R. N. (b) Phys. educ. major (c) Med. tech. grad. with B.S. degree	12 mos. June and Sept.	.....	Univ. fees
Mayo Clinic, Rochester, Minn.	Frank H. Krusen, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	.....	6 mos. Jan. and July	None
Barnes Hospital, St. Louis	Frank H. Ewerhardt, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos.	.....	.....
St. Louis University, School of Nursing, St. Louis	Alexander J. Kotkis, M.D.	High school grad.	4 yrs. Jan. and Sept.	.....	\$250 yr.
University of Buffalo, School of Nursing, Buffalo	George G. Martin, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos. Feb. and Sept.	6 mos. Feb. and Sept.	\$425 R \$375 E
Hospital for Special Surgery, New York City	Kristian G. Hansson, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos. Sept.	6 mos. Sept.	\$300 R \$200 E
New York University, New York City.....	William Bierman, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos.	.....	.....
D. T. Watson School of Physiotherapy, Leetsdale, Pa.	Jessie Wright, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll. ¶	2 yrs. Sept.	6 mos. Jan. and July	None R \$200 E
Richmond Professional Institute of the College of William and Mary, Richmond, Va.	Thomas W. Wheeldon, M.D.	(a) R. N. (b) Phys. educ. major (c) Coll. graduate (d) High school grad.	8 mos. 4 yrs. Feb. and Sept.	.....	Coll. fees
University of Wisconsin Medical School, Madison	Ernst A. Pohle, M.D.	(a) R. N. (b) Phys. educ. major	12 mos. Feb. and Sept.	6 mos.	Univ. fees R
University of California Hospital, San Francisco	Frances Baker, M.D.	(a) R. N. (b) Phys. educ. major (c) B. A. degree **	48 wks. October	.....	\$150.00
Cleveland Clinic Foundation Hospital, Cleveland, Ohio.....	Walter J. Zeiter, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos. July	.....	None

State University of Iowa College of Medicine, Iowa City, Iowa. (Details will appear at a later date.)
Graduate Hospital of the University of Pennsylvania, Philadelphia, Pa. (Details will appear at a later date.)

* Courses are so arranged that any of the entrance requirements (a, b, c or d) will qualify students for training.

** Acceptable science courses required.

† R = regular course; E = emergency course.

‡ Four year course leads to B.S. degree from Simmons College.

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MEETINGS OF PHYSICAL THERAPY ORGANIZATIONS

In these columns will be published information about meetings, election of officers, etc., of physical therapy organizations. New data should be sent promptly to the office of the Secretary, 2 E. 88th St., New York.

Connecticut Physical Therapy Society; meetings held in May and October at same time as the Connecticut State Medical Society. Dr. Karl Bretzfelder, 315 Whitney Avenue, New Haven, Conn., Secretary-Treasurer.

New England Physical Therapy Society; meetings at Hotel Kenmore, Boston on third Wednesdays from October to June; Dr. William McFee, 41 Bay State Road, Boston, Mass., Secretary.

New Jersey Society of Physical Therapy Physicians; meetings to be held monthly during the winter season in various centers in the State. Dr. Robert F. Dow, 592 East 29th Street, Paterson, N. J., Section Ave., Germantown, Phila., Secretary. (See announcement elsewhere this issue.)

New York State Medical Society, Physical Therapy Section, Buffalo, May, 1943, Dr. K. G. Hansson, Secretary, 33 East 61st Street, New York.

New York Physical Therapy Society; meetings on first Wednesdays, from October to May, New York City; Dr. Madge C. L. McGuinness, 1211 Madison Avenue, New York, Secretary.

Kings County Medical Society, Physical Therapy Section; meetings at 1313 Bedford Avenue, Brooklyn, bi-monthly on second Thursdays; Dr. Samuel A. Warshaw, 1373 Ocean Parkway, Brooklyn, N. Y., Secretary.

The Penna. Academy of Physical Medicine; meetings at the Phila. County Medical Building, 21st and Spruce Streets, third Thursday, alternate months, starting with January; Dr. Harold Lefkoe, 5217 North Broadway, Philadelphia, Secretary-Treasurer. (See announcement elsewhere this issue.)

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